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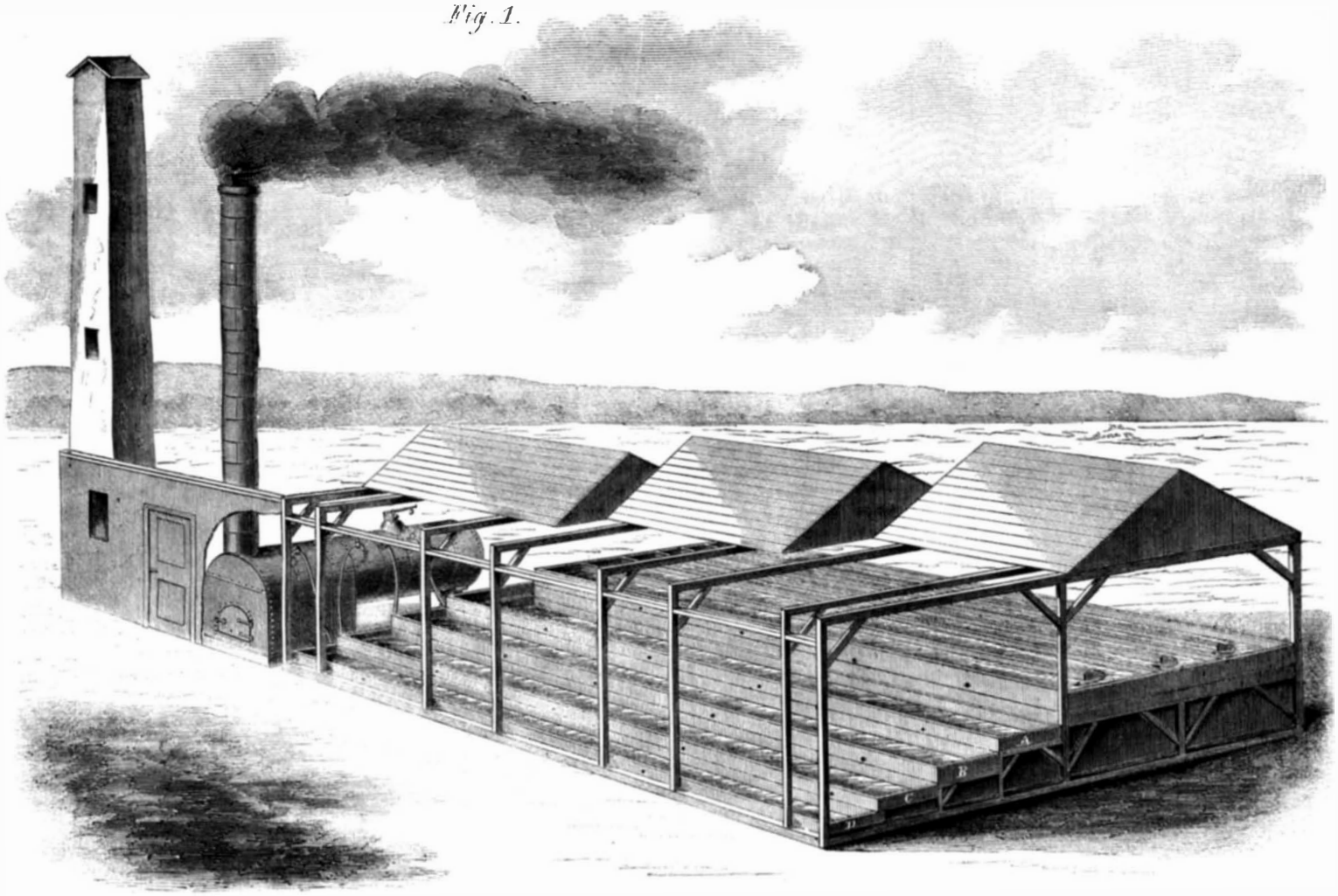
Improved Salt Block.

In another page will be found a full account of the marvelous growth of the salt manufacture of Michigan; the business having within three years transformed a comparative wilderness into a busy and prosperous region. This rapid development of salt making is leading to many improvements in the process of manufacture, and all of these which are of any importance we hope to illustrate in our pages. The annexed engraving is a picture of a salt block, invented by a resident of the new salt district who has the manufacture going on under his eyes, and who believes that very considerable economy both in fuel and labor will be effected by his improvements.

Fig. 1.



GARRISON'S SALT BLOCK.

Vats, A B C and D, for evaporating the brine are constructed with double bottoms, a space being left between the two bottoms for the circulation of steam or hot air. If steam is used it may be generated by a boiler placed at the end of the block and conducted into the spaces at the bottom of the vats by pipes. The pipes are supplied with stopcocks for directing the steam below any of the vats where it may be required.

Before the brine is let into the vats it is partially evaporated in a broad trough, which is partially divided by partitions starting alternately from either end so as to form a zigzag channel, through which the brine flows over a false bottom like those of the vats, where it is heated in the same manner as in the vats.

The several vats are placed on successive descending steps, so that the brine may be drawn from one to another by merely opening a cock, thus avoiding all expense of dipping and pumping in the process of manufacture.

When the brine is evaporated to the proper point the bitters are drawn off, and the salt is crytallized and dryed in the same pans which are used for effecting the evaporation.

The patent for this invention was granted through the Scientific American Patent Agency, Aug. 19, 1862, and further information in relation to it may be obtained by addressing the inventor, C. O. Garrison, at East Saginaw, Mich.

Cast-Steel Bells.

The London *Mechanics' Magazine*, speaking of steel in the great Exhibition, says: The cast steel bells of Messrs. Naylor Vickers & Co., are so well known that it becomes a superfluous task to do more than mention them here. All who have gone into the Exhibition must have observed those which grace the eastern transept, or have heard their clear and silvery sounds. During the last five years, we are told, no less than three thousand steel bells, varying in size from 7 feet 6 inches in diameter down to 12 inches, have been purchased from the Sheffield works. They have the advantage over bronze bells of costing 40 per cent less per pound, and as they are made of far less thickness in proportion to their diameter than bronze, it is easy to comprehend the economy, in all respects derivable from their use. Large as has been the demand for steel bells, it is probable that the publicity given them in the Exhibition will greatly extend that demand.

A FRENCH company has been formed in Paris, with a capital of £10,000 for the cultivation of cotton in Algeria. The company also propose to cultivate other crops, such as corn, olives, vines, tobacco and flax; and will further breed cattle on a large scale, and will likewise propagate the rearing of silkworms, cochineal and other valuable produce. The land proposed to be cultivated by the company comprises a surface of nearly 26,000 acres.

IN India, the mercury in the thermometer has been observed to stand at 145° in the direct sunlight, and at 120° in the shade. In high latitudes the temperature is sometimes as low as 100° below zero. A Russian army, in an expedition to China, in 1839, was exposed for several successive days to a temperature 42° below zero.

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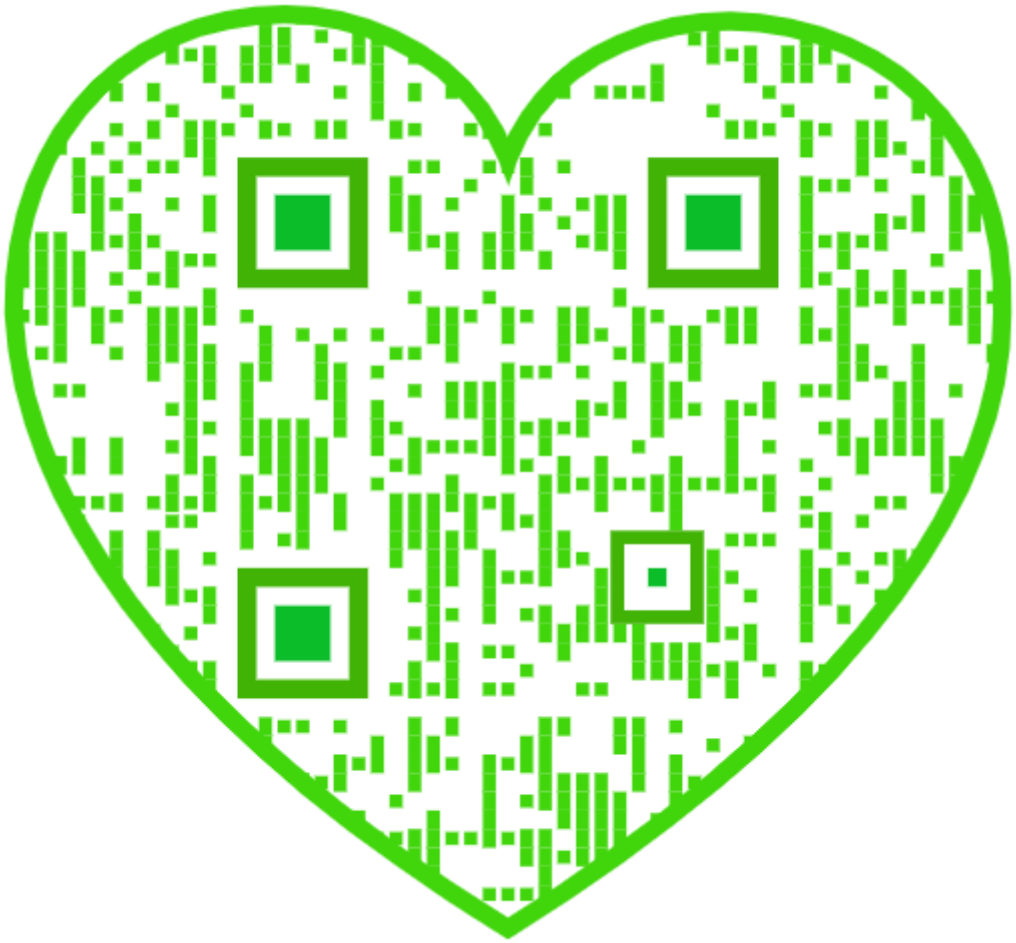

NOTES ON NAVAL AND MILITARY AFFAIRS.

The week succeeding our last summary of the war news has been one of great movements. Along the northerly bank of the Potomac for a space of some 60 miles immense armies have been marching and countermarching in efforts to out-manouver and conquer each other.

EVACUATION OF FREDERICK.

The Frederick *Citizen* of September 12th, gives a minute account of the occupation of that town by the rebel army. As we stated last week the town was taken possession of on Saturday, September 6th. The *Citizen* says :—

On Saturday morning, about ten o'clock, considerable numbers of the Confederate soldiers had entered the city, and as they entered at the south end the last of the Federals left at the north end of Market street. The central square of the city was soon densely packed with citizens congregated to see the "terrible rebels;" but most of them with the hope of seeing those of our fellow citizens who had long since left us and joined the Southern cause. Of these we cannot speak but in general terms. While all received a hearty welcome from their personal friends of all parties, of course Colonel B. T. Johnson, seated in the center of the square, on a fine charger, looking remarkably well, but greatly changed by the wear and tear of long service, received most marked attention. We were glad to discover that, in spite of the acerbity of party spirit, which has unhappily prevailed to a very lamentable extent in this community ever since this war commenced, there were large numbers of those citizens known as Union men who approached and grasped him and his comrades in arms cordially by the hand.

These salutations and greetings lasted for some two hours, but all this time thousands of troops from other States were flowing in a continuous stream into the city, blocking up the thoroughfares and crowding the boot and shoe stores, the groceries, clothing establishments, tobacconists, confectionaries, saddlers, tinners and green grocers, in quest of the various articles, which, after their long and weary march —and coming as they did from a State almost exhausted of supplies—they stood so much in need of. The stores and shops generally, after being thronged for several hours with eager purchasers, were closed, in order to expedite business satisfactorily to merchants, and small parties permitted to enter at a time as the first comers had been supplied. The Confederate soldiers seemed to be well supplied with Confederate States money, as well as with "green backs," and some of them with gold and silver. They were eager to purchase the necessaries of which they stood in need, and also the luxuries which they fancied, and were prompt to pay any price demanded. Money with them seemed to possess little or no value compared with the gratification of their wants. It may well be imagined that our tradespeople had more customers than they could supply, as their stocks on hand were limited to the ordinary wants of the community. The Confederate money or scrip was freely received by the merchants in exchange for their merchandise. The same we believe is true in regard to millers and farmers in the sale of flour, corn, hay, oats, horses, cattle, &c.

With the single exception of a demonstration on the *Examiner* office on Saturday night about eleven o'clock, by, as we understand, some dozen or more soldiers, influenced by the representation of a citizen, no damage was done to any private property, and no insulting language used or wrong done to any citizen that we have heard of. The soldiers who attacked the *Examiner* office were promptly arrested by the Provost Marshal's guard as soon as their unlawful proceedings were reported at the office of the Marshal, and severely punished. They may have been under the influence of liquor, but this was no excuse for the outrage they committed on private property. The freedom of the press is guaranteed by the Constitution which our fathers established, and they were faithless to the great principle of republican liberty for which they profess to be periling their lives, when they undertook, outside of the forms of law civil or military, to punish the editors and proprietors of the *Examiner* for their opinions by the destruction of their property.

The different corps and divisions of the army encamped within three or four miles of the city north, and south of it. During Sunday, Monday and Tuesday the city was crowded by soldiers from the various camps, though by nine o'clock at night but few stragglers could be found on the streets. On Wednesday morning by three o'clock the grand army was on its march westward, and from that hour until nine o'clock at night there came pouring along regiment after regiment with music and banners flying, and cheer upon cheer from the countless hosts of brave and stalwort men as they passed the houses of those of our citizens whose wives, daughters or visiting female friends, by waving of handkerchiefs or secession emblems indicated their sympathy with the cause they were defending. For eighteen hours there was a continuous and multitudinous succession of cavalry, infantry and artillery, together with wagons laden with quartermaster and ordnance stores.

About six o'clock on Tursday morning troops again commenced to pour through the city. It was not until about ten o'clock that the last of this heavy division passed through. How many men there were in this countless host we know not. But it was certainly the mightiest exhibition of military force and power that we have ever witnessed. We could not but tremble at the thought of the terrible sacrifice of human life which will be offered up to the devil of fanaticism before that dirty, ragged, barefooted, but elastic, cheerful, confident, resolute, well armed, multitudinous host will be conquered, if conquered it ever can be. Where this wonderful army of men from Texas, Louisiana, Arkansas, Mississippi, Alabama, Georgia, South Carolina, North Carolina, Virginia and Maryland, has gone to we know not.

GENERAL M'CLELLAN'S MOVEMENTS.

Our last week's account left General McClellan at Rockville, 14 miles northwest from Washington. From this place he moved slowly toward the northwest, in the direction of the enemy, and on the 12th of September his advanced guard entered Frederick, having a slight skirmish in the streets with about 250 of the rebel cavalry, a lingering remnant of the great army. Our troops were received by the citizens of Frederick with the wildest delight ; some of our soldiers said that such a reception was enough to pay them for all their toils and sacrifices. General McClellan's army passed through Frederick in pursuit of the retiring enemy to Middletown, which is 9 miles northwest of Frederick. Some three or four miles beyond Middletown is a long ridge called South Mountain, through several passes in which the country roads are made. In these passes General Lee planted his batteries to check the advance of our pursuing columns. General McClellan's forces advanced in two divisions, Generals Burnside and Reno at the right, and General Franklin at the left. The result is announced by General McClellan in the following dispatches :—

[Number One.]

HEADQUARTERS, ARMY OF THE POTOMAC, Sept. 14—9:40 P. M.

TO MAJOR-GENERAL HALLECK :—

After a very severe engagement the corps of General Hooker and General Reno have carried the hights commanding the Hagerstown road by storm. The troops behaved magnificently. They never fought better. General Franklin has been hotly engaged on the extreme left. I do not yet know the result, except that the firing indicated progress on his part. The action continued until after dark, and termiuated leaving us in possession of the entire crest. It has been a glorious victory.

I cannot tell you whether the enemy will retreat during the night or appear in increased force during the morning.

I regret to add that the gallant and able General Reno was killed.

G. B. McCLELLAN, Major General Commanding.

Number Two.]

HEADQUARTERS, ARMY OF THE POTOMAC, Sept. 15—3 A. M.

TO MAJOR-GENERAL HALLECK :—

I am happy to inform you that General Franklin's success on the left was as complete as that on the center and right, and resulted in his getting possession of the Gap, after a severe engagement in all parts of the line. The troops, old and new, behaved with the utmost steadiness and gallantry, carrying, with but little assistance from our own artillery, very strong positions, defended by artillery and infantry. I do not think our loss very severe. The corps of Generals D. H. Hill and Longstreet were engaged with our right. We have taken a considerable number of prisoners.

The enemy disappeared during the night. Our troops are now advancing in pursuit. I do not know where he will next be found.

G. B. McCLELLAN, Major General Commanding.

[Number Three.]

HEADQUARTERS, ARMY OF THE POTOMAC, Sept. 15—8 A. M.

TO MAJOR-GENERAL HALLECK :

I have just learned from General Hooker, in the advance, who states that the information is perfectly reliable that the enemy is making for the river in a perfect panic, and General Lee stated last night, publicly, that he must admit they had been shockingly whipped.

I am hurrying everything forward to endeavor to press their retreat to the utmost.

G. B. McCLELLAN, Major General Commanding.

[Number Four.]

HEADQUARTERS, ARMY OF THE POTOMAC, Sept. 15—10 A. M.

TO MAJOR-GENERAL HALLECK :

Information this moment received completely confirms the rout and demoralization of the rebel army.

General Lee is reported wounded, and Garland killed.

General Hooker alone has over a thousand more prisoners, seven hundred having been sent to Frederick.

It is stated that Lee gives his loss as seventeen thousand !

We are following as rapidly as the men can move.

G. B. McCLELLAN, Major General Commanding.

SURRENDER OF HARPER'S FERRY.

At the time of the great rebel invasion of Maryland, Harper's Ferry, on the south bank of the Potomac, was held by a division of our troops under the command of Col. Miles. Another detachment of our troops was at Martinsburg, 19 miles farther in Virginia, under the command of General White. The rebels sent a heavy force to surround and capture General White's command, but he received intelligence of the movement and fell back on Harper's Ferry, saving himself by two hours' start of the enemy. After he arrived at the Ferry, Col. Miles offered him the command of the place, but he declined it in favor of his brother officer. The enemy enveloped the place in overwhelming numbers, and Col. Miles sent to Gen. McClellan for reinforcements. Gen. Franklin was accordingly dispatched to the aid of the beleagured garrison, but he was obliged to fight his way through masses of the enemy, and his march was slow.

On Saturday the rebels made an attack with artillery on our forces on the Maryland Hights. This was supported by a large infantry force, and the fighting continued through the day. There were a good many killed and wounded during this fight on both sides.

About four P. M. our forces abandoned Maryland Hights, the rebels having been largely reinforced and overpowering them. The retreat was made in good order. The artillery was spiked and our wounded taken away. During the day the rebels made their appearance on Loudon Hights, which is on the Virginia side, about a mile and a half from Harper's Ferry. Their signal corps appeared on the Block House, and commenced operations. They were shelled from Camp Hill, and at the third shell disappeared. They, however, continued to appear at this point at intervals through the day, notwithstanding our fire.

During Saturday they were planting batteries there, which would command both Bolivar Hights and Harper's Ferry. During Saturday afternoon the rebels also made their appearance in force on the Charleston turnpike. They were shelled from Bolivar Hights, but did not return the fire during all this time.

On Sunday morning there was infantry skirmishing on the Charleston turnpike. The rebels also used artillery from the same direction ; but little damage was done, and for two or three hours the fighting was almost entirely suspended. About two P. M. the enemy succeeded in getting their batteries in position on Loudon Hights, and a heavy artillery fire was commenced by them simultaneously from Loudon and Maryland Hights and from the direction of the Charleston turnpike. The cannonading from this time until about sunset was terrific. Our batteries from Bolivar Hights, and, in fact, every gun that could be brought to bear upon the enemy, replied. While this was taking place there was a general infantry engagement on the Charleston turnpike Nearly our whole force was engaged in this battle. The rebels were in very strong force and the fighting was desperate. While this was going on the Garibaldi Guard crossed the river and brought off the artillery left on the Maryland Heights except the three siege guns.

During the night of Sunday the rebels had placed additional batteries in position, and at daylight Monday morning opened from seven or eight different points. They, in fact, completely surrounded the Union forces.

About eight A. M. Col. Miles was severely wounded in the left leg by a piece of shell. After this the command was assumed by General White. Reinforcements not coming up as had been anticipated, it was

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thought useless to further continue the fight, and the works, with all the forces, &c., were surrendered at ten A. M. by General White to General Hill.

Officers and privates were released on parole, but of course all the arms, munitions, &c., fell into the hands of the enemy. By this important capture the rebels secured a safe passage for their great army across the Potomac, on its retreat before our forces. It is stated that the reinforcements under Franklin were within three hours' march of the place at the time of its surrender. The number of the prisoners is variously stated at from 5,000 to 8,000.

THE CAVALRY CUT THEIR WAY OUT.

On Sunday night, after our forces were completely surrounded, Col. Davies obtained permission to cut his way out with the cavalry, some 2,300 strong. They accordingly crossed the river at about eight o'clock Sunday evening and succeeded in reaching Greencastle, Pa., with the loss of about 40 men.

HARPER'S FERRY EVACUATED BY THE REBELS.

As we go to press it is reported that the rebels immediately evacuated Harper's Ferry, retiring before McClellan's army in such haste that the paroles of only a portion of the prisoners were taken, the others being unconditionally released.

OUR FORCES DRIVEN OUT FROM WESTERN VIRGINIA.

On Wednesday Sept. 10th a column of the enemy, about 5,000 strong, said to be under command of General Loring (the first notice of whom was his appearance in our rear, between Fayette and Gauley), made an attack on the Thirty-fourth and Thirty-seventh Ohio, under Colonel Siber, numbering 1,200 men, encamped at Fayette on the Great Kanawha. A desperate battle was fought, lasting till dark. Our forces cut their way through, reaching Gauley during the night, having lost one hundred killed and wounded. Meantime another column of the enemy approached Gauley bridge, on the Lewisburg road cutting off the Forty-seventh Ohio, two companies of the Ninth Virginia and one company of the Second Virginia cavalry, who were at Summerville. Nothing has since been heard of them.

Under these circumstances Colonel Lightburn's front, flank and rear, being threatened by an overwhelming force he was compelled to evacuate Gauley, which was successfully done on the 11th, after destroying all the government property he was unable to bring away. He moved down the Kanawha in two columns, one on each side of the river; reaching Camp Platt, on the afternoon of the 12th, he made another stand on the lower bank of the Elk river, where a desperate fight ensued, lasting from morning till dark. Our forces shelled and burned Charleston, two houses only being left. The result of the fight is unknown. Nothing has been heard of Lightburn since Saturday at six P. M. Up to that time our troops were holding the ground, punishing the enemy severely. It is understood that our forces destroyed all the salt works. Lightburn brought six hundred loaded wagons safely to Elk river. The retreat to Elk river was conducted in good order. Great anxiety is felt for the safety of Lightburn's command, as well as Point Pleasant and Gallipolis.

Since the above was in print we learn that the force at Summerville succeeded in joining Col. Lightburn, and that the whole command has arrived safely at Ravenswood on the Ohio river.

SKIRMISH AT WASHINGTON, N. C.

On September 6th, a sudden attack was made by the rebels on Washington, N. C.

Just as the midnight darkness began to pass away, and the fog of this season of the year commenced to ascend in many thick clouds, a portion of the Third New York cavalry, as also a portion of the Third New York artillery, formed under command of Colonel Mix for a contemplated expedition to a far distant point. Scarcely had it reached the outskirts of the town when firing, gradually increasing in rapidity and volume of sound, was heard in the opposite direction or rear. Colonel Mix, fearing danger, countermanded the general order of march, and, on subsequently being informed of the approach of the enemy, gave the order for the cavalry to charge.

While this was being done by the Unionists, a body of rebel cavalry, some three or four hundred strong, charged down the front and main street in the most desperate manner. In this way they passed a portion of our battery, and reached a position almost at the end of the town, in the opposite direction from which they had entered. There they were met and engaged in a hand to hand encounter by Captain Gerrard, of Company D, of the Third New York cavalry. The fight then became general, and continued four hours, ending in a complete route of the rebel troops. Our forces were aided by the gunboat *Louisiana*, which lay in the Pamlico river opposite the town.

In the beginning of the fight, the gunboat *Picket*, which lay above the bridge, and in the stream at the upper portion of the town, prepared to engage the rebels just as they brought the artillery and infantry to the edge of the city. In an instant an explosion was heard, and fragments of wood and humanity were seen to fill the air. Nineteen persons including the commander were killed, and ten were wounded.

GENERAL BUELL MARCHING NORTHWARD.

Our last accounts left General Buell's army some 70 miles southeast from Nashville, Tenn. He has fallen back to that city, and on the 7th of September his army marched out in two divisions to the north; its destination being probably Bowling Green, Ky., on the railroad to Louisville. It is supposed that the object of this movement is either the capture of Kirby Smith or his expulsion from Kentucky.

GENERAL BRAGG IN KENTUCKY.

On Monday September 16th, General Bragg's advance attacked our forces at Mumfordsville, Ky., a station on the Louisville and Nashville road, 115 miles from Nashville and 72 from Louisville. This shows a very rapid advance of Bragg, and as General Buell is south of him, he will doubtless be able to form a junction with Kirby Smith, when the combined forces may attack either Louisville or Cincinnati, or the army of General Buell, as the commanders shall decide.

Return of Mr. Hall, the Arctic Explorer.

On the 13th of September, the Bark *George Henry*, with Mr. C. F. Hall, the arctic explorer, arrived at New London, Conn.

Mr. Hall is in excellent health, and is sadly grieved at the present state of our national affairs.

The details of his expedition are of unusual interest. Mr. Hall is a mild and unassuming gentlemen, full of energy and tact, and has won the admiration of the scientific men of this and the Old World. He arrived in the Arctic regions late in 1860, and, as the seas were so free from ice, he was very anxious to immediately proceed with his mission; but, notwithstanding the bright aspect of affairs, he wisely took the counsel of the Esquimaux, who would not consent to make up a boat party for the purpose of prosecuting the work.

The intervening time was occupied in learning the Innuit or Esquimaux language from the natives. In the matters of clothing and food Mr. Hall adopted the Innuit style, and was dressed in skins and fed upon raw meats, with a due share of blubber.

By his courteous manners and powers of adaptation he soon became a favorite among the natives, and they were ever of the greatest assistance to him. In 1861 his explorations were renewed with energy. He had become acclimated, and was fully alive to the amount of work which was before him. A whaleboat was now procured from the *George Henry*, and with a crew of six Innuits, male and female, he started on his northern journey. The natives take their families with them when on these expeditions, and the women pull an oar with the men. Dogs are also of the company, and several native boats are taken for the purpose of hunting and fishing with. Thus provided with *personnel* and *materiel* they started, living on prepared food, in small quantities, but mainly depending upon game captured on the way.

Mr. Hall went to Countess of Warwick Sound, and after much difficulty succeeded in discovering the place where Frobisher attempted to plant a colony. A considerable time was spent here in obtaining relics of that ill-fated colony. At nearly every place of their debarkation relics were found consisting of pieces of coal, brick, wood, and a portion of a cannon shot, which might have been used as boat ballast.

The coal had been overgrown with moss, and a dark vegetable growth; the brick looked quite fresh and new; the wood was simply chips, which, although embedded in the coal dust for nearly three hundred years, are well preserved. The piece of iron is well worn with the rust of so many years.

One of the most palpable facts in connection with the discovery of these people is, that Mr. Hall discovered a trench twenty feet deep and one hundred feet long, a species of dry dock, leading down to the water. In this excavation the party of Frobisher's men who were captured by the Esquimaux on his first voyage, with the assistance of some of their captors, built a small vessel, in which they were to embark and sail to England. In due time she was completed and put to sea, but heavy weather coming on, and their vessel proving unseaworthy, they were obliged to return. All of this crew were severely frost bitten. Despairing of ever reaching their native land, and being severely frost bitten, the captives soon died.

The facts of their mode of living and attempts to reach England were gathered from the Innuits. Mr. Hall says that the traditional histories of the Esquimaux are remarkably clear and explicit, and can be relied upon to the greatest extent. Mr. Hall has discovered a very large and interesting mountain of fossils at the head of Frobisher's Bay. He also discovered an immense glacier near Queen Elizabeth's Land. This he named the "Grinnell glacier," in honor of Mr. Henry Grinnell. It exceeds three thousand feet in hight, is one hundred miles long and fifty miles in width.

Mr. Hall has brought home with him a very interesting family of Innuits or Esquimaux. E-bierbing, the husband, is a fine looking fellow, about twenty-four years of age; but he is not so large and good looking as was Cad-la-go. Tuk-oo-h-too, the wife, is about the same age as her husband, and is the interpreter. Tuk-er-lik-e-ta, the infant child, is one year old, and is a fine child. The father and mother went to England some years ago and were presented to the Queen. They, of course, are not so much surprised at seeing a civilized country.

In addition to expedition relics, Mr. Hall has a large collection of memorials of his social sojournings among the Innuits. They consist of a variety of articles, cut from bone and ivory, representing polar bears, seals, walruses, ducks, &c. They are very interesting specimens of workmanship, and coming from so remote a region are doubly valuable.

According to Mr. Hall, life in these high latitudes is not so difficult of preservation as is generally supposed, the snow and ice houses of the Innuits being exceedingly tight and comfortable, and their coarse animal food rendered palatable by the sharpness of appetite engendered by the keen atmosphere of an extreme northern climate.

APPLETON'S CYCLOPEDIA OF DRAWING.

D. Appleton & Co., 443 and 445 Broadway, this city, have published a work in parts which constitutes a complete cyclopedia of drawing. One part treats on Drawing Instruments and Their Use, another on Topographical Drawing, another on Architectural Drawing and Design, another on Mechanical Drawing, another on Perspective and Isometrical Drawing, and another on Shading and Shadows.

The work is edited by E. Worthen. We have examined it and can recommend it to our young readers who desire to become proficient by self-teaching in any branch of drawing. The rules are laid down in a very clear and precise manner, and all technicalities fully explained. The part pertaining to Shading and Shadows gives full instruction for coloring different parts of machinery, such as brass, cast and wrought iron, wood, &c. Many professed draughtsmen fail in this branch of the art and would doubtless be benefited by a study of the work.

Results of Running the Blockade.

The London *Times* of the 2d of September announces the failure of Mr. Pearson, a ship builder of Hull. It seems that Mr. Pearson has been extensively engaged in the business of running cargoes through the blockade into our Southern ports, and though he succeeded in getting several vessels through, he did not succeed in getting the pay for his merchandise. His debts are stated at $2,000,000.

PROFESSOR RICHTER, of Leoben, Styria, recommends the use of a small quantity of the oxide of lead mixed with molten iron, for the purpose of removing sulphur and phosphorus from the latter. Four pounds of the oxide of lead is a sufficient quantity for 1,000 lbs. of iron.

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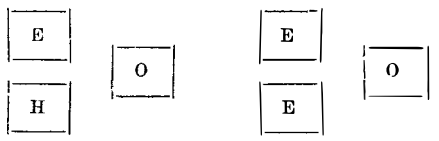
THE COLOR PRODUCTS OF COAL---MAUVE AND MAGENTA.

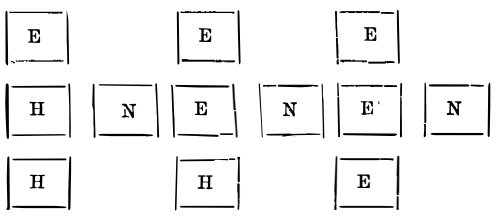
[Continued from page 180.]

Let me take as an illustration the compound atom, ethyl, consisting of two atoms of carbon and five of hydrogen ($C_2 H_5$=E), which is familiar to the members of the Royal Institution. By inserting one or two ethyl atoms into the hydrogen mold I generate the molecules of ethylated hydrogen, or ethlated ethyl (free ethyl).

In a similar manner, by introducing either one or two ethyl atoms into water, I convert the molecule of water into the molecules of the two ethylated waters, alcohol and ether.

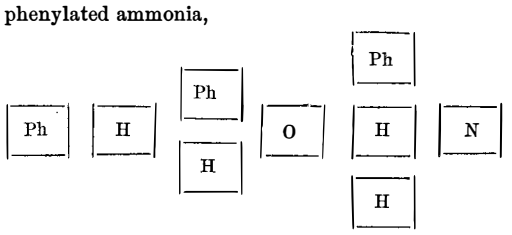


Displace, lastly, one, two or three hydrogen atoms in ammonia, by one, two or three ethyl atoms, and you give rise to the formation of the molecules of the three ethylated ammonias,



better known as ethylamine, diethylamine, and triethylamine,

At the risk of exhausting your patience, I repeat some of these changes with another compound atom of a composition differing from that of ethyl. These mauve-colored cubes may represent a compound atom, containing six atoms of carbon and five of hydrogen ($C_6 H_5$= Ph), to which chemists have given the name of "phenyl." Charge each of our type molds with an atom of phenyl, and you accomplish the construction of phenylated hydrogen, phenylated water, and phenylated ammonia,



substances better known as benzol, phenol, and analine; and the existence of which in coal-tar oil I have already pointed out to you.

But it is time for us to return to the point from which we started. What has the recognition of our types to do with the distillation of coal? In what manner do they explain the formation of the variety of substances generated in this process. In coal we have the elements of the three types of matter, and we find that hydrogen, water, and ammonia are in fact produced to a very appreciable extent during its distillation. The quantity of free hydrogen is generally small; moreover, mixed as it is with the carboneted hydrogens of coal gas, its presence among the products of distillation of coal is not easily demonstrated by experiment. Water and ammonia, on the other hand, are abundantly generated, and nothing is easier than to exhibit their production. In fact, the coal-tar oil which we have produced in our distillation experiment, is covered, as you observe, with a layer of water, and the application of test-papers to the latter shows that it contains a large amount of ammonia. Now, consider that our types are generated from coal in the presence of large quantities of carbon and hydrogen, two elements which, in proportions varying to an almost unlimited extent, may aggregate under the influence of heat to compound atoms similar to ethyl and phenyl; remember, moreover, that these atoms are capable of displacing, partly or entirely, the hydrogen of our types, and you will realize without difficulty the number of compounds which may be formed by the distillation of coal; I say which may be formed, for the diagram which I have exhibited to you enumerates only the bodies which have actually been obtained; but every day brings forth new substances. It is obvious that the nature of the compound atoms generated must, in a measure, depend upon the composition of the coal distilled. The composition of coal, however, varies between very considerable limits. In the subjoined diagram I give you a synopsis of the results obtained in the analysis of several specimens of coal.

ANALYSIS OF DIFFERENT COALS.

Locality of coal.	100 Parts of Dry Coal						
	Contain					Leave.	
	Carbon.....	Hydrogen..	Nitrogen...	Sulphur....	Oxygen....	Ash.....	Coke.....
Anthracite, Wales.....	91·44	3·36	0.21	0·79	2·58	1·52	92·20
Anthracite, Wales.....	90·39	3·28	0·83	0·91	2·97	1·61	92·10
Caking Coal, Newcastle	81·41	5·83	2·05	0·75	7·90	2·07	66·70
Cannel Coal, Wigan....	80·07	5·53	2·12	1·50	8·09	2·70	60·36
Coal, Wolverhampton..	78·57	5·29	1·84	0·39	12·88	10·30	57·21
Wallsend, Elgin.....	76 09	5·22	1·41	1·53	5·05	10·70	58·40
St. Helens. Lancashire.	75·80	5·21	1·92	0·90	11·89	5·17	65·50
Methill Brown Coal.....	65·96	7 78	0·96	0·75	9·23	15·32	
Bohemian Brown Coal..	55·59	4·16	19·06			21·19	

A glance at this diagram shows you that the carbon in the several specimens varies by more than 30 per cent being 91.4 in Welsh anthracite, and 55.5 in Bohemian brown coal. Similar, though less marked discrepancies are perceptible in the other constituents. If you recollect, in addition, that the nature of the compound atoms generated in the distillation of coal must be influenced, moreover, by the temperature, which again oscillates between limits widely apart, you cannot fail to perceive that the destructive distillation of coal must be an almost inexhaustible source of new compounds.

The separation of the individual substances from the complex mixture called coal-tar oil appears, at the first glance, to present almost insurmountable obstacles. But the principles made use of for this purpose are very simple. The individual compounds contained in coal-tar oil may be separated in a great measure by distillation, their boiling points varying, as may be seen by a glance at the diagram, to a considerable extent. But additional means of purification offer themselves in the different deportment which these substances exhibit under the influence of chemical agents. I could not, perhaps, in this respect, bring under your notice a more instructive illustration than the behavior with acids and bases of the three coal-tar oil constituents, repeatedly quoted. Benzol, phenol, and aniline, may thus easily be separated. To demonstrate this point experimentally, two glass cylinders have been half filled with benzol, two others with phenol, and two further ones with aniline; a solution of litmus having, moreover, been added, each of the three substances is treated in one cylinder with acid, in the other with alkali. In the case of benzol, you observe the indifferent hydrocarbon, insoluble both in acid and alkali, floating colorless upon the colored liquid; phenol, being an acid water derivative, is not acted upon by the acid, but readily dissolves in the alkali; aniline, lastly, being a well-defined ammonia derivative, exhibits the converse deportment, resisting the action of the alkali, and forming a homogeneous solution with the acid.

Each of the three coal-tar oil constituents which I have mentioned, and of which you have characteristic specimens upon the lecture table, has received important applications in the arts and manufactures. Benzol is the most convenient solvent for caoutchouc; as an agent for removing oil and grease it has become an ordinary household article; phenol, when treated with nitric acid, yields us a beautiful yellow dye, called by chemists "carbazotic acid;" but the practical interest attached to phenol you will more immediately appreciate if I tell you that this compound presents the greatest analogy with creosote, a substance, I am afraid, but too well known to most of us—a considerable portion of the creosote of commerce being in fact simply phenol; aniline, lastly, is the source of mauve and magenta, and must therefore claim our attention more particularly this evening.

The amount of aniline which exists in coal tar is very limited; a preparation from this source upon a sufficiently large scale could never be attempted. Fortunately, chemists are in the possession of a series of processes by which aniline may be produced in any quantity. Benzol, the phenylated hydrogen, may readily be converted into aniline, the phenylated ammonia.

(To be continued.)

Revolving Shields for Guns.

We notice that the British newspapers make the same kind of complaints against the naval authorities of England, that have and not unjustly, been sometimes brought against our American naval authorities. They are too conservative. On this subject *Mitchell's Steam Shipping Journal* says:—

We possess two fine steam rams, the *Resistance* and *Defence*, but those ships could be destroyed by the smallest war vessel afloat. One of the plans laid before our Admiralty for their approval, which has been explained to us, is so simple and effective, that our only surprise is that it has never been adopted. That our Admiralty Board will take up any such scheme, unless it comes from France or some other country, it would be idle to expect. There is a staff of persons at the Controller's Office, who acts as national buffers to stave off all innovations an old systems, unless they come with a passport from the Emperor of the French. We have recently had a striking illustration of this. Visitors to the National Exhibition will see in the Naval Department a small gun on a traversing carriage, with an inscription stating that it is a relic of the *Royal George*, from the wreck at Spithead. Many persons have looked upon it as a mere curiosity; but the gun and carriage are exhibited to show a new mode of filling the aperture of a port with a revolving shield. Lord Clinton, R. N., and another gentleman, are the exhibitors. The gun goes out through a ball, or spherical revolver. This revolver moves on axles, and allows the gun to be turned in every direction; and whichever way the gun is pointed, whether elevated, depressed, or trained aft or forward, there is no opening disclosed for the entry of a Minié bullet. When the shot is discharged, the gun recoils, and the revolver turns, and presents a closed appearance on the exterior. This plan permits ports to be made larger, and guns can be so depressed as to fire into a vessel nearly under the muzzles. From the description given of the *Arkansas* it appears she had a revolving shield of this character, and it seems to have answered admirably by protecting the crew. We are building turreted or cupola vessels, whose guns could not discharge a ball to strike gunboats if they got close alongside of them, so that a small vessel might batter away at them with comparative impunity. When the model of the spherical shield for portholes was shown to Sir Baldwin Walker, the gallant Admiral, in the spirit of self confidence that animates the bosom of our tars, put his foot upon it, as the Yankees would say, and remarked that if all sorts of contrivances for saving life were introduced into the navies of the world, there would be no sacrifices, and wars would never end. We will not do the late Controller-General the injustice to insinuate that he was indifferent to the fate of our seamen, or that if another country adopted inventions of this character, he would have set his face against them; but there is no originality at head quarters. Our authorities wait to see the effect of "innovations," or, as an official is reported to have said, "confounded innovations," before they move, and then come reconstructions on an expensive scale.

Aluminum Wire.

The problem of drawing aluminum into wire has been resolved by M. Garepou, of Paris, an artizan, who now conducts the operation in a truly workmanlike manner. He furnishes the aluminum wire at from 60 to 100 per cent cheaper than silver wire of the same length. The price of aluminum is always about 200 francs per kilogram. For the purpose of drawing it into wire they commence with rods of aluminum of one mètre in length and twelve millimèters diameter—these the inventor easily reduces to wires of the size of a hair, and many hundred kilomètres in length. These products appear in the International Exhibition, where are exhibited articles of lace work, such as epaulets, embroideries, textile fabrics, entire head dresses, with mounting and ornaments constructed entirely of aluminum. These articles are remarkable for their lightness, and they show that a novel manufacture has been created by the new process of drawing aluminum into very fine wire.

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THE MICHIGAN SALT WORKS.

In the midst of the great civil war that is raging in the land, a great industry has been growing up with marvelous rapidity in the wilds of Michigan. The existence of salt springs in the lower peninsula of Michigan has been known from the time of its earliest settlement, and when in 1836 the State was admitted into the Union, the privilege was granted her of selecting 72 sections of salt spring lands. In the following year she organized a geological survey, principally for the purpose of ascertaining the number and distribution of the salt springs in the State. This survey led to erroneous conclusions, and the borings for salt which followed these conclusions were unsuccessful.

In 1859 a second survey was commenced and this led to the discovery and announcement, for the first time, that below the carboniferous limestone of Michigan occurs a series, 180 feet thick, of argillaceous shales, clays, magnesian limestones, and beds of gypsum; and that here is truly the origin of the brine. The strike of the outcropping edges of these strata describes an irregular circle, inclosing all the central portion of the State. The Michigan salt group of rocks underlies 17,000 square miles, in the form of a vast reservoir, constituting the most magnificent saliferous basin on the continent. The edges are sufficiently elevated to prevent the efflux of water which finds its way into it, and hence the saline particles have never been washed away. Beneath this series of shales is a porous sandstone—the Napoleon sandstone—which, within the circumference of the basin, becomes saturated with brine from above. From the nature of the case, it is evident that the strongest brine must accumulate in the deepest part of the basin.

Under this more intelligent guidance new borings were commenced and a well at East Saginaw reached the solid rock at the depth of 92 feet, and after passing through the coal measures, with their terminal and initial sandstones, pierced the carboniferous limestone, and found the Michigan salt group of strata 169 feet thick and eminently saliferous. In the Napoleon sandstone beneath, 109 feet thick, the reservoir of the brine was struck, and a supply, abundant in quantity, and of 90° strength, was obtained at almost exactly the point which geology had predicted. This well was 669 feet deep, terminating near the middle of the sandstone. Another was subsequently bored, 806 feet deep, extending through the sandstone and penetrating the underlying shales 64 feet.

This decided success was attained early in 1860. By July of that year a "block" had been erected and boiling commenced. Before the close of the year 4,000 barrels of salt had been manufactured, and no less than four other companies had commenced boring at different points along the river.

The following analyses will exhibit the strength and purity of Saginaw brines in comparison with those of other salt producing regions :—

	Saginaw City.	East Saginaw.	Bay City.	Syracuse, N. Y.	Kanawha, Va.
Specific Gravity.....	1·180	1·170	1·163	1·142	1·073
Chloride of Sodium...	19·246	17·912	19,692	17·690	7·309
Chloride of Calcium...	2·395	2·142	0·742	0·156	1·526
Chloride of Magnesium	1·804	1·522	0·432	0·119	0·374
Sulphate of Lime.....	0·534	0·116	0·145	0·573	....
Sulphate of Soda.....	....	....	0·116	....	....
Compounds of Iron...	0·064	0·105	....	0·002	....
Other constituents....	0·127	0·220	0·013	....	....
Total solid matter in 100 parts.....	24·170	22·017	21·140	18·540	9·209

As pure saturated brine has a specific gravity of 1,205, and contains 25·7 per cent of saline matter, it appears that the Saginaw brines approximate remarkably near to saturation.

The following table exhibits further comparisons :

Localities.	Weight of one gall. of brine.	Solid matter in one gall.	Pure salt in one gall.	Galls. required for 1 bu. salt.
Saginaw City..lbs.	9·856	2·38	1·90	29
East Saginaw.....	9·775	2·15	1·75	32
Bay City.....	9·716	1·95	1·82	31
Syracuse.....	9·541	1·476	1·68	33
Kanawha.....	9·464	0·94	0·75	75

An intelligent writer in *Hunt's Merchants' Magazine* for September, to whom we are indebted for these interesting facts, states :—

It is now but two years since the first salt was manufactured in Saginaw valley; yet it is estimated that in this time the value of real estate has increased to the extent of three and a half millions of dollars in the counties of Bay and Saginaw. At Carrolton, grounds suitable for salt lots, which, two years ago were bought for $20 an acre, are now held at $300 and $400 per acre. At Saginaw city, salt lands have risen from $30 to $200 and $300 an acre. Wood lands, from one to eight miles west and north of Saginaw city, which, as late as 1861, sold for $15 and $20 per acre, are now selling for $40 and $45 per acre. At Bay city, the increased valuation has been similar. And this is but the first impression of the creation of this new branch of industry in what is generally regarded as a Michigan wilderness.

He also gives the following account of the processes of boring the wells and manufacturing the salt :—

In the boring of the wells of the Saginaw valley, steam power is always used, and the tools and details of the process are similar to those employed in Ohio and Virginia. The boring is generally done by contract. The price per foot two years ago was $3; at the present time it is $2, and I see no reason why the price should not be reduced to $1 50 per foot for wells not over 900 feet deep, since the engine—the only costly part of a well borer's outfit—is furnished by the employer. The well is bored of an enlarged diameter, and tubed as far as the "bed rock." Beyond this, a diameter of 3½ to 5 inches is the usual capacity. On the completion of the boring to the requisite depth, the hole is tubed with iron to some point below the place of influx of fresh water. This is generally the carboniferous limestone; and here some sort of packing is introduced around the tube for the purpose of shutting off communication between the inside and outside of the tube. The strong brine rises to within 5 to 10 feet of the surface, and sometimes overflows—in one instance rising in a tube as high as 17 feet. In all cases, however, a pump is introduced into the well for the purpose of securing an adequate supply.

The water is pumped at an expense of about three cents per barrel of salt, into vats of cisterns elevated about five feet, and having generally a capacity of 20x30 feet and 6 feet deep, holding consequently about 26,000 wine gallons each. Two of these vats are requisite for each block. In the cisterns, the water is allowed five or six days to settle—that is for the iron to be precipitated—a process which is generally facilitated by sprinkling in the brine a small quantity of strong limewater.

The kettles are arranged in two close parallel rows, and supported by walls of brick and stone, forming an arch with a longitudinal partition—or more properly two arches, in the mouths of which the fires are built. A chimney, from 50 to 100 feet high, rises at the back extremity of the arches, and thus the heat is made to pass under each kettle of the double series. The arches are inclosed in a house 120 feet by 40, or thereabouts, with a shed running the whole length of each side, divided into large bins for the reception of the salt. At the Bay city works the bins occupy a separate building, into which the salt is wheeled and emptied. This arrangement permits an opening to run the whole length of the block on each side, for the admission of air to drive the steam from over the kettles.

After settling, the brine is conveyed into the boiling house in logs, which run along the arch above the kettles, resting on the middle wall which separates them; and from these logs supplies are drawn as needed, into the kettles.

It may be of interest to note that kettles are not manufactured at Bay city, by a firm recently from Chatham, Canada West.

The fuel employed is generally a mixture of hard and soft kinds, for prices varying from $1 31 to $1 50 per cord. Hard wood, consisting of maple, beech, hickory, ironwood and birch, is exclusively employed at the East Saginaw works, and costs delivered $1 75 per cord. One block, including the engine, consumes about six cords of hard wood, or six and a half cords of mixed wood, in twenty-four hours.

The brine, of course, evaporates much the most rapidly in the front kettles, immediately over the fire. These have to be filled once in three to five hours, and the back ones once in fifteen to twenty-four hours. Settling pans are introduced into kettles just filled, for the purpose of receiving any impurities precipitated by the application of heat. Occasionally milk, blood, or some other animal substance is employed to promote the clearing of the brine. Generally, also, some skimming is needed; and the more when the brine is purified in the manner just mentioned. The contents of the kettles are reduced by boiling to one-fourth or one-fifth the original quantity, when the salt, crystallized and fallen to the bottom, is transferred to baskets supported over the kettles, where it is allowed to drain.

The baskets at first used were of the Syracuse pattern; but these being found too small, a new style, patented by a Michigan man, and of larger size, is now generally employed. These cost forty cents each.

The baskets of salt, when moderately drained, are emptied into the bins, where the salt lies fourteen days to complete the drainage.

In the meantime, the kettle is replenished with brine and the same process is repeated. After a kettle has been boiled down two, three or more times, the accumulation of bitterns needs to be thrown out. Some prefer to do this after every kettle full. The bitterns are thrown into a conduit which runs at a convenient distance, and are thus carried out of the block.

The work is thus prosecuted day and night for the period of two to five weeks—the boilers and firemen succeeding each other in relays every twelve hours. At the end of this time the rapid evaporation and great heat of the front kettles has caused an incrustation to be formed upon the bottom from one or two inches in thickness. This must be removed, or it acts as a false bottom, permitting an interval to form between it and the kettle, thus rendering the bottom of the kettle liable to be melted out. In the Syracuse works this crust contains so much gypsum as not to be readily soluble, and is picked out with iron tools, to the great danger of the kettles. In the Saginaw works the crust is almost pure salt, and is at once loosened and removed by the simple introduction of fresh water, which is obtained from a second set of logs introduced for the purpose. The fires are permitted to go down on Saturday night. During Sunday the arches cool. On Monday any needed repairs are attended to, and on Monday night the fires are rekindled.

The amount of salt produced in twenty-four hours from a block of a given number of kettles, varies with the strength of the brine, the state of the atmosphere, the quality of the fuel, and the attention of the firemen. At Portsmouth, in good summer weather, 40 barrels are made per day from 50 kettles.

The packing of the salt is done for three cents a barrel. The barrels used cost from twenty-four to twenty-six cents—the price varying with the quality. Elm barrels with pine heads are generally employed; but at some of the works pine is used exclusively. These barrels are manufactured in stave and barrel factories opening in the vicinity, and are admitted to be a superior article for salt packing. No objection exists against elm staves, provided they are cut narrow; otherwise they are somewhat liable to warp, on exposure to the weather, and might in some cases endanger the package. The tidy appearance of the packages of Saginaw salt has everywhere recommended it to notice.

The solar manufacture is yet in its inception. The East Saginaw Co., have 20 solar vats in operation; and the prospects of success in this method of manufacture are so great that 500 additional vats and covers have been constructed, making a total outlay in the coarse salt manufacture of $8,500. Five hundred barrels have been produced.

The method of boiling in kettles is evidently too primitive and wasteful of heat to be tolerated by an inventive people. Immense quantities of caloric are transmitted from the arches to the ground and entirely lost. In Chapin's method the heat is conducted in every direction only into the brine. If he could now devise some means to utilize the steam, the economy of caloric would be complete. In the opinion of the writer, steam pipes might be made to replace the two flues in the condensing vat, and fuel employed—but in redoubled amount—only in the graining vat. We wait with interest to learn whether Mr. Chapin's process is destined to turn the old potash kettles on their sides.

In the process of boiling in kettles, two firemen and two boilers are required for each block—the firemen relieving each other at intervals of 12 hours, as also the boilers. At some of the works it is in contemplation to let the boiling—which can be done for ten cents a barrel—the company furnishing the fuel. This method, while it would increase the quantity of

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salt produced, might somewhat endanger its excellence. Under the present arrangement, boilers are paid $1 75 per day, and firemen $1. The wages of an engineer are $1 50 per day, and of common hands $1.

(This process was illustrated on page 97 of the current value of SCIENTIFIC AMERICAN.)

The total amount of fine salt manufactured in the Saginaw Valley up to the 1st of July of the current year was, nearly one hundred thousand barrels. At the present time, the number of blocks in actual operation is 22, with an aggregate of 1,187 kettles. Several of these blocks have started within a few days. There are, besides, four or five new blocks just ready to go into operation, to say nothing of the three blocks nearly completed for evaporation, by the Kanawha and Chapin process. If the 22 blocks now in operation succeed in maintaining the standard of productiveness established by the old ones, they are turning out daily 1,210 barrels, which, making an allowance for the check of winter amounts to 396,000 barrels or 1,980,000 bushels annually This is not a calculation of what the Saginaw works are expected to do; it is what they are doing at this moment; and shows a growth at the end of two years from the production of the first bushel of salt, equal to that attained by the Onondaga salt works in 1834, at the end of 38 years from the time the salt springs passed under the superintendence of the State. But it is not necessary to pause here. Within thirty days, or by September 1st, not less than four additional blocks would come into operation, raising the daily production to 1,300 barrels, and the annual production to 468,000 barrels or 2,340,000 bushels—a result only reached by the Onondaga salt works less than twenty-five years ago.

The only question which remains, and one upon which the predicted growth of the manufacture must depend, is that which respects the quality of Saginaw salt. There is no corner on which our predictions rest with greater security. The appearance of a pile of Saginaw salt is that of driven snow glistening in the morning sun. The grain is coarse, clean, and angular; the taste purely saline and unexceptionable, and the weight is 58½ lbs. to the measured bushel. Letters and documents are in the hands of the manufacturers proving that the acceptance of Saginaw salt is such that the market is literally clamorous for an adequate supply. It would occupy too much space to make many citations. The Mechanics' Institute, of Chicago, the New York State Agricultural Society, (at Elmira), and the Mechanics' Association, of Utica, have severally awarded the salt of the East Saginaw Company their highest testimonials. Harvey Williams, Esq., one of the oldest and most extensive fish packers on the lakes, certifies; "My experience and observation lead me to the opinion that the salt manufactured by your company is purer, stronger, safer, and more economical for fishermen than the Syracuse fine salt." He also names several other parties who have used the salt for fish packing with the same results. In Detroit, this salt is ranked equal to any, and is very often called for in preference to Syracuse salt. The annual statement of the trade and commerce of Toledo, says: "We are led to the conclusion that eventually all the beef, pork, &c., packed west of Lake Erie, will be laid down in Saginaw salt." Dow, Quirk & Co., of Chicago, think Saginaw Salt "superior to any that comes to this market." Large quantities of this salt are now sold in London, C. W., whence it is distributed through the province. St. Louis and Cincinnati also take large supplies, and the demand, at all these points, is far more than can be furnished.

THE Emperor Napoleon is continually adopting new methods of warfare, testing all the improvements that are brought to his notice, and introducing the best of them into his army. A recent letter from the camp at Chalons says that he is now instituting experiments to test a new plan for firing cannon by electricity. The advantage of this method is said to be that it insures perfect accuracy of aim, while the action is of course instantaneous.

TELEGRAPH POLES.—In all the new lines of the Electric and International Company in the south of England, Mr. Preece, resident engineer to the company, is putting up ten posts per mile, their average distances apart being therefore, 528 feet.

Correspondence

SAXONY—ITS MINING SCHOOLS AND METALLURGY.

FREIBERG, Saxony, August 11, 1862.

MESSRS. EDITORS:—Few who have not traveled in Europe can duly estimate the seclusion which 30 miles of mountain road entail upon a town. Here, for centuries, manufactures, agriculture and mining have been conducted by this community of a few thousand souls away from the main line of travel; and local habits of dress and deportment, style of furniture and living, have grown up to distinguish this people from their neighbors. No wonder, then, that the formal opening of the railroad hence to Dresden, 30 miles, which has taken place to-day, should have been made the occasion of a grand *fete*. The beauty of Dresden, as well as the mahogany-colored, brass-ornamented and brawny-armed peasant girls of the country, the yellow-liveried servants of his Majesty the King of Saxony, and the grey and dark green Tyrolese-uniformed students of the Thavandt Agricultural School, the miners of this great center of Saxony's mines, and the Erzgebirge mountaineers, all were here to share and increase the general joy. And now Saxony sends greeting to Pennsylvania—Freiberg to Pottsville, that here as well as there the treasures of our common mother may be placed upon the iron way, and without transshipment transported to the seaside for kindly exchange and common advantage. Pottsville—Freiberg—what a contrast! The one the growth of 30 years, the other a town in A. D. 1000. I passed to-day through the grand and elegantly sculptured portal of the Cathedral. The sculptures were executed A. D. 1185, and form a perfect gem of Architectural beauty, representing the figures of saints—but I forget; the *Scientific American* is not the organ of the Antiquarian Society. It deals with the great progressive present, and here where the most perfect methods of mining at great depths, especially the ores of lead and silver, are employed, and the most refined methods of extracting these metals from their ores, are pursued, the lover of applied science can find as much of interest to him as can the antiquary. Nor is it necessary that he descend amid damp and darkness, and explore deep pits and narrow galleries, for the cabinet of the Bergacademie comprises the most complete set of models, beautifully contrasted and arranged on convenient tables, where, aided by the polite direction and description of the model master and his son, a few hours' examination will teach you more than weeks spent in groping under ground. Here are mining sections in wood exhibiting all the plans of shoring or of sustaining galleries. Models over 10 feet in hight, supplied with water by which the wheels revolve, and the whole process of draining and of extraction as practiced in Saxony, may be learned at a glance; the most recent and approved processes of crushing, washing and separating ores, and the best forms of furnaces for roasting, smelting and refining both the rich and the poor ores of Saxony and of other European States. What a treasure, say you, these would be in America. So thought I, and you will share the gratification with which I learned that the model-master was already engaged in making a set ordered for the United States? American enterprise not only directs the ordinary walks of commerce, it pervades our educational institutions. With the young men of America the proverb of Mahomet and the mountain is to be reversed; as they cannot come to the mines, the mines (in miniature) are to go to them! The institution which is to do its country this great favor is the Polytechnic College of Pennsylvania, located in Philadelphia. That school, which, in the thoroughness of its instruction in civil and in mechanical engineering, has earned for itself the reputation of being *l' Ecole Polytechnique* of America, is about to sustain an equal reputation as a school of mines. An institution which, in these times of general depression, has the purse and the nerve to obtain for its students the inestimable advantages which the study of these models will give them, deserves the thanks of the whole Union. Nearly six months will be required to complete the set, when they will be sent and placed in the cabinet of the College.

Nearly all the American news we get in the *Leipzig Zeitung* and other German papers, has unfortunately passed through that dirty part of London known as the *Times* office.

I go hence to the great Austrian manufacturing city of Brünn, which has taken so many medals at the present London Exhibition. SAXO-AMERICAN.

The Way Menhaden Oil is Made.

MESSRS. EDITORS:—Thinking that a description of the manufacture of menhaden oil, and some facts in relation thereto, would not be uninteresting to large numbers of your readers, I inclose the following which you can publish in your valuable paper if you think proper:—

In our bay (the Peconic) there are no less than six manufactories, consuming in the aggregate, about 2,000,000 fish weekly. The fish are caught in Gardiner's bay mostly, where they abound in great quantities. They are taken by what we call purse seines, and can be caught in any depth of water. The seine is made (as its name indicates) like an old-fashioned purse; after rowing around the fish the bottom is closed by a purse line and the fish are secure. There are four companies of fishermen from Rhode Island here at this time, having from four to five large boats apiece and from eight to nine men The fish are bought for $1 per thousand. These seines some days catch 150,000 each, which you see makes a paying business of it. The manufactories are nearly all on different plans. Some use large tanks in which the fish are placed and into which steam is forced. A portion of the oil is extracted, coming on the surface of the water and is skimmed off; the water is then drained off and the refuse is pressed by hydraulic presses or powerful levers. In another way of working, used by one manufactory, the fish are placed in a large iron cylinder similar to a boiler, and steam is let in at a given pressure while the cylinder is made to rotate by steam engine. The fish are steamed from 12 to 15 minutes then turned out and subjected to hydraulic pressure, which of course, extracts oil and water together. This runs off through pipes into tanks where the oil rises to the top and is taken off. There is a patent for this cylinder style, as it is called. The fish after being pressed are dried on large platforms (some of them covering half an acre of ground), and after being thoroughly dried the mass is ground into what is called fish guano, ranging in price from 25 to to 35 dollars per tun, and is considered an excellent fertilizer. These manufactories employ from 15 to 60 men each and consume an enormous quantity of fish. That it is a paying business I have no doubt, considering the amount invested which is considerable, the manufactories costing from 10,000 to 60,000 dollars each. I have not gone into the minutiæ of the business, but have written enough to show that we are a stirring people, and that if there is anything on land or sea which can be turned into money we are the ones to find it. WHITE HILL.

Greenport, L. I., Sept. 8, 1862,

A Practical Flying Machine.

MESSRS. EDITOIS:—I have invented and constructed a machine that rises or flies from its resting place by its own motive power. I put two clock springs on to the lower end of two shafts one within the other, and running in opposite directions. On the top of each shaft are long arms with screw wings, so arranged that when put in motion by the springs the machine rises up. At the eighth revolution the power of the springs are exhausted, consequently it is raised but a little way. But it shows the principle on which a steam engine may be made to travel in the air with or without a balloon.

This machine acts on the principle of a propeller, except that the propeller pushes, and this pulls, and the arms of this are longer that the spent air may not come against the machine. I have exhibited it to Mr. Joseph Sullivan, of Columbus, one of the most scientific men of Ohio, who says that it is the first inanimate thing that ever raised itself into the air by its own motive power without a balloon.

JEREMIAH RANDALL.

West Jefferson, Ohio, Sept. 5, 1862.

[Mr. Sullivan is in error, as a rocket rises by its own motive power, and we presume higher than your machine. Still, with your model you might make

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some experiments which would be interesting. By measuring the power required to wind your spring, by weighing your machine, and observing to what hight it rises, you will let inventors know how much power an engine must have in proportion to its weight in order to raise itself by spiral wings. No steam or air engine yet constructed has this proportion of power. You can measure the power required to wind your springs by winding them with a weight and observing how far the weight descends. Wind a cord around the spring shaft and hang a light tin pail on the end of the cord. Then pour successive ounces of sand into the pail and measure the distance to which each ounce lowers the pail. Make these observations and send us the result.—EDS.

Spiral Fluted Nails and Bolts.

MESSRS. EDITORS :—My attention has been called to a notice in your paper of 23d of August last, of "spiral fluted nails," said to be invented and recently patented to Mr. W. Wizzel, of Exeter, England, but which your article attributes to Mr. Samuel Pratts, of Boston, patented to him Oct. 25, 1853.

My only object is to call your attention in this connection to my patent of the 8th of January, 1842, for improvement in "cut and wrought spikes, bolts, nails and brass;" applicable to the smallest nail or largest bolt in a ship or other wooden structure; specimens of which, in great variety, were deposited in the Patent Office at the date of my patent which covers the whole principle, and I think fully settles the question of originality of the invention which seems to be disputed. As to the spikes and nails my invention dates back to the year 1829. The following is a copy of the claim as patented :—

Now, what I claim, &c., is the "screw form given to the angles of the body of the spikes, bolts, nails, &c., by twisting them in the manner herein set forth and described, or by any other means producing substantially the same results."

With a letter, dated April 18, 1842, I sent specimens and memoir, through the resident French minister (M. de Bascourt), to the Prince de Joinville, as peculiarly applicable to naval structures, and it is highly probable that our English cousins obtained the idea from this source.

In 1849 I received letters from gentlemen in high position here at the time, highly commending my invention; these letters were published with a long editorial and description in the *Washington Union* newspaper of August 18, 1847. At the same time specimens were exhibited by a friend to Messrs. Simonson & Co., and other large shipbuilders in New York.

The patent having expired without renewal and my official engagement having prevented the introduction of my invention, all pecuniary interest in it has ceased; but I am gratified that it now promises to benefit mankind at large, as I always felt confident it would some day, and this will be my only reward. I will mention before concluding that I now prefer twisting the iron cold, or to give the spiral form in the operation of drawing the bars.

W. T. STEIGER.

Washington, Sept. 10, 1862.

Cannon of Large Caliber.

MESSRS. EDITORS :—Many people suppose cannon of large caliber are comparatively of recent origin. This is an error. The 22-inch gun (of Constantinople), mentioned in No. 10 of the SCIENTIFIC AMERICAN, and also those 28-inch ones of the Dardanelles, were made many years ago. But none of these are "the largest in the world," as stated by your correspondent. The GREAT GUN of the Kremlin, in Moscow, is a trifle larger than either of them, being of 36-inch caliber, 18 feet long, and weighing 97,500 pounds. An inscription on this small pistol shows it was made at Moscow, by Andrew Tchoff, in the year 7094, which corresponds with the year 1586 of the Christian era. Here is a gun weighing almost five tuns, and made 276 years ago! M. M.

Grand Rapids, Mich., Sept. 10, 1862.

A 10-INCH shell made of homogeneous metal, and filled with molten pig iron, was lately fired at a 4½-inch iron plate in England, at 100 yards distance, and made an indent two inches deep. The charge of powder was only nine pounds.

Egyptian Steam Irrigation and Cultivation.

About twenty years ago Ibrahim Pasha erected a steam engine of 100-horse power to take the place of 500 wheels which supplied water from the Nile to market gardens in the neighborhood of Boulac. When the natives saw the machinery put together, and were told its object, they pronounced the governor mad, but when they saw the huge machine belching out columns of water, they at once said the Franks had brought a devil, to empty the Nile.

Such is the fertilizing power of the Nile water, that when the Cornish engine just mentioned was erected, 700 or 800 acres of land were brought under cultivation in the immediate vicinty of Cairo, by means of leveling a number of sandhills, and mounds of accumulated rubbish, probably the sites of some former towns or villages. These are now covered with market gardens and sugar fields; the latter are chiefly for the consumption of the Cairenes, and when in season, one rarely encounters an Arab on the road who is not engaged in chewing and sucking the sugar cane; vendors, squatted on the ground, sell it in every part of the town at the rate of one and two canes a penny.

The division of this land into fields and gardens is effected by planting rows of prickly pears, which grow so rapidly and in such a stalwart manner, as soon to defy entrance, except by the legitimate gateways, in addition to forming a secure fence. The fruit, which they bear in abundance, is also sold in the streets and markets of Cairo. In order to form a fruit garden in Egypt it is necessary to choose a site above the highest water mark of the Nile, or to raise the ground above that level, to avoid the water from overflowing, or filtration forcing its way in and lying about the roots of the fruit trees, an evil fatal to many, especially to orange trees. The management of the date palm, the citron tribe, vine, fig, melons and water melons, forms the chief occupation of the Arab fruit gardener.

The date palm is cultivated from one end of Egypt to the other, and forms a source of great revenue to the Government; it also furnishes abundance of nutritious food for the people, at the moment when gathered ripe from the trees, and afterward in a pressed and dried state. From Cairo upward, the dates are of superior quality compared with those of Lower Egypt; each tree pays a tax of an Egyptian piastre (about six cents) to the revenue, and produces to its owner in good seasons about a dollar in the shape of fruit, and fiber for rope making; the lower leaves are also used for making crates, seats and bedsteads. The male and female palm are both grown; it is always necessary to have several of the former in every grove and clump of female trees. They are generally planted in the form of suckers, which are produced in abundance at the foot of the old trees; where they have neglected to plant male trees, or probably where the latter have died, the growers are obliged to cut spathes of the male blooms and tie them in the trees near the female flowers, leaving the pollen, which is produced in abundance, to be scattered by the wind.

Tribute to American Reaping Machines and Inventive Genius.

The *Mark Lane Express*, the highest authority on agricultural subjects in England, pays a high compliment to American reaping machines, and the benefits they have conferred upon British farmers. It says :—

Mr. McCormick, of Chicago, Illinois, has laid the world under new obligations. No one can pretend to be insensible to the economic benefits which have been conferred upon the farmers of this country by the introduction of the reaping machine, which was the wonder of the Exhibition of 1851. Entrusted to the prudent and energetic agency of Messrs. Burgess and Key, it has played an important part in the salvation of our harvests, when otherwise they must have suffered to a considerable extent on account of the westward movement of our rural population. It was, in fact, the first machine in England which settled the question, in the farmer's eyes, between the mechanical and the manual process of corn cutting. When we say that from the Brentwood Works so many as 3,000 reapers have already been supplied to the farmers of the United Kingdom, each capable of cutting down from twelve to fifteen acres a day, that hundreds of men are laying low the golden harvests, and conserving the fruit of man's toil in the fields of France, Russia, Spain, Germany, Italy and Belgium, and that, further, the inventor within the last twenty years has supplied—but without the screw platform, which is not required in that country—40,000 machines to secure the grain crops of the world, some slight idea will be gained of the benefits which may be conferred upon his fellow men by one persevering thinker.

We are not much in the habit, it is true, of considering ourselves under any obligation to those who are supposed to have made "a good thing" of their inventions. But inasmuch as inventors have been known to be actuated by high spirit and a desire to promote their country's progress, it may be that we shall come to look at these matters in a different light, and regard some of them as highly as those who, by virtue of large gifts, obtain exclusive possession of the cognomen "philanthropic." If it is true that we can never remunerate an inventor for his idea, because in its vast influence upon the world it is not possible to estimate its value, and that we can only remunerate him for his labor in perfecting the machine, and superintending the work of others in the reproduction of it, it is pretty clear that the world is laid under an obligation to the extent of the value of the idea, whatever that may be. We rise in the scale of civilization as we become masters of the circumstances in which we are placed, as we become superior to the elements around us.

Appetite and Food of Esquimaux.

The gastronomic capabilities of the Esquimaux and other Northern races and their fondness for fatty food, are exhibited in a sufficiently strong light in the following statements :—

Captain Parry weighed and presented to an Esquimaux lad the following articles :—

	lb.	oz.
Frozen seahorse flesh	4	4
Wild seahorse flesh	4	4
Bread and bread dust	1	12
Rich Gravy soup	1	4
Water	10	0
Strong grog	1 tumbler	
Raw spirits	3 wine glasses.	

This large quantity of food, which the lad did not consider excessive, was consumed by him within twenty-four hours. According to Captain Cochrane a reindeer suffices but for one repast to three Yakutis, and five of them will devour at a sitting a calf weighing 200 lbs. Mr. Hooper, one of the officers of the *Plover*, in his narrative of their residence on the shores of Arctic America, states that "one of the ladies who visited them was presented, as a jest, with a small tallow candle, called a purser's dip. It was, notwithstanding, a very pleasant joke to the damsel, who deliberately munched it up with evident relish, and finally drew the wick between her set teeth to clean off any remaining morsels of fat."

On this subject the late Dr. Kane, the Arctic explorer, said :—"Our journeys have taught us the wisdom of the Esquimaux appetite, and there are few among us who do not relish a slice of raw blubber, or a chunk of frozen Walrus beef. The liver of a walrus, eaten with little slices of his fat—of a verity it is a delicious morsel. Fire would seem to spoil the curt, pithy expression of vitality which belongs to its cooked juices. I wonder that raw beef is not eaten at home. Deprived of extraneous fiber, it is neither indigestible nor difficult to masticate. With acids and condiments, it makes a salad which an educated palate cannot help relishing; and as a powerful and condensed heat-making and anti-scorbutic food, it has no rival. I make this last broad assertion after carefully considering its truth. The natives of South Greenland prepare themselves for a long journey, by a course of frozen seal. At Upper Navik they do the same with the narwhal, which is thought more heat making than the seal; while the bear to use their own expression, is 'stronger travel than all.' In Smith's Sound, where the use of raw meat seems almost inevitable from the modes of living of the people, walrus holds the first rank. Certainly this pachyderm (*Cetacean ?*) whose finely-condensed tissue and delicately-permeating fat (oh! call it not blubber) assimilate it to the ox, is beyond all others, and is the best *fuel* a man can swallow."

A SOLUTION containing silica and alumina in solution, hardens soft stone, and renders it very durable.

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Improved Bayonet Guard.

"The bayonet is the queen of weapons," is a maxim of many renowned conquerors. These sharp points of steel, if firmly held in rank, will turn back the bravest cavalry, and on these all commanders rely for the preservation of their artillery. The skillful handling of the bayonet, therefore, is one of the most important arts for the soldier to learn, and in military schools a great deal of attention is devoted to teaching it. At West Point the cadets are taught to fence with india-rubber bayonets at the ends of their muskets, and the rapid and furious manner in which they thrust the points into each other's faces and against all parts of their bodies is perfectly terrific.

ERNST'S BAYONET GUARD.

John G. Ernst, of York, Pa., has invented a guard to be attached to the end of an ordinary bayonet scabbard, so that the teaching of the bayonet exercise may be continued, as a part of the regular drill while the soldiers are in camp, without any danger to their persons. It consists simply of an india-rubber ball attached to the end of the scabbard and of a device for fastening the scabbard securely to the bayonet, so that there will be no danger of the scabbard being thrown off in the exercise.

The invention is illustrated in the annexed engravings. The scabbard, *a*, of the bayonet (see Fig. 2) is enlarged at the point to receive a hollow ball of india rubber, *b*, which coming in contact with the face or person will inflict no injury. The scabbard is secured to the bayonet by a metallic ring, *c*, which is attached to the scabbard by an elastic band, and is made of such form that it will not pass around the shoulder of the bayonet unless it is drawn downward to where its wide part may pass around the shoulder. Intelligent manipulation is thus required to remove the scabbard, and there is no danger of its flying off accidentally. The scabbard is attached to the soldier's belt by the flat hook, *d*, which fits into a metal loop secured to the belt for this purpose.

By having these guards attached to the ends of the bayonet scabbards all the soldiers may be regularly practiced in bayonet fencing without danger to their eyes or bodies. In fencing with india-rubber bayonets the arm is lighter than in service, and the muscles are, consequently, trained and developed to a less degree of strength than is required in battle, but with this guard the weapon is a few ounces heavier than it is with the bayonet naked, and the soldier trained to its use will handle his arm in battle with greater ease. The expense of adding this guard to the ordinary scabbard is very trifling, and we are told that many officers of high rank have recommended its adoption in the army. It is also especially adapted to the use of militia regiments that are drilling in the evening.

A patent for the principal features of this invention was granted through the Scientific American Patent Agency, Aug. 5, 1862, and application for a patent on some further improvements embraced in this illustration has been made. The invention has been assigned to the inventor jointly with Wm. B. Welsh and Frederick Stallman, and further information in relation to it may be obtained by addressing Ernst, Welch & Co., York, Pa., Box 251.

Fig. 2

Manufacture of Alcohol from Coal Gas.

The following caustic remarks are from the *Chemical News*:—

The daily and weekly press, whose scientific paragraphs at this season of the year are more calculated to astonish than instruct the public, have lately contained announcements of a discovery to the above effect, at St. Quentin, by a young chemist named Cotelle. The paragraph goes on to state that a Joint Stock Company, with a capital of 400,000 francs, has been formed to carry out the patent. The inventor announces that he can sell his alcohol at 25 francs the hectolitre, while the most inferior spirit produced from other articles is selling for 75 francs the hectolitre. This, like many other chemical patents, is utterly impracticable on the large scale. M. Cotelle has read that M. Berthelot, some years ago, succeeded in transforming olefiant gas into alcohol by the intervention of sulphuric acid, and has jumped to the conclusion that as coal gas contains a considerable quantity of olefiant gas, he has only to shake it up with sulphuric acid to produce alcohol as he likes. We have seen M. Cotelle's patent; in it he claims to produce alcohol of good flavor by means of purified lighting gas passing over (*traversant*) liquid sulphuric acid, or by bringing it in contact with the acid in vapor (*avec l'acide en vapeur*). Our readers who know the long and tedious operation by which even a minute trace of alcohol can be produced in this way, will not envy the shareholders who have subscribed with such wonderful rapidity.

To make Superior Hospital Lint.

A very rapid method of making superior lint for wounds may be easily put into operation by a carding machine. Take any cylinder from six to ten inches in diameter, covered with common card clothing; lay an old card "doffer or lickerin" on the "strippers" of a wooden card; place it on a "grinder" frame, or even upon the centers of a common lathe, where a velocity of 600 or 800 revolutions per minute can be obtained; then take old table covers, napkins, sheets, &c., or any old linen rags; and apply one end to the cylinder, holding fast with one hand to the other end; with the other hand press the goods on to the cylinder, guarding this hand by fastening a piece of belt leather to the palm, allowing the end of the same to project one-half an inch beyond the finger tips. Do not allow the cloth to lie upon the cylinder too far, as it will only tear the cloth or make a poor quality. One person, by this process, can produce more lint, and of a superior quality, than 5,000 can, by scraping in the ordinary way, in the same time.

CONGELATION OF WATER.—Dr. Robinet has addressed a curious communication on the congelation of water to the Academy of Medicine. It is well known that the blocks of ice formed in the sea yield fresh water by liquefaction. When sea water or any saline dissolution is congealed the pure water is separated in the form of ice, and there remains a concentrated watery solution of the saline matter. It is thus salt is economically obtained in the north of Europe. To increase the alcoholic strength of wine it may be subjected to artificial cold, whereby the water alone which it contains is congealed and the wine becomes richer in alcohol. By operating in a similar manner on potable water Dr. Robinet has found that it loses nearly all its salts, whether soluble or not. The waters of the lake of the Bois de Boulogne having been subjected to the operation, the small quantity of calcareous and magnesian salts they contained were eliminated. The purity of the water is such that it may be used in many cases instead of distilled water

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VOL. VII. NO. 13.....[NEW SERIES.]....*Eighteenth Year.*

NEW YORK, SATURDAY, SEPTEMBER 27, 1862.

IRON-CLAD VESSELS BUILDING AT NEW YORK.

An immense iron-clad fleet is now in the course of construction in this port, and the most intense activity is being displayed to complete some of these vessels at an early date. At the Continental Works of T. F. Rowland, Green Point, five turret ships are in progress, and one of these has been launched, and will soon be finished. They are called the *Passaic, Montauk, Katskill, Onondaga* and *Puritan.* The latter will be 320 feet in length, with a beam of 50 feet. At Colwell and Co., Jersey City, the turret ship *Weehawkin* is being rapidly pushed forward; and at the Delamater Iron Works, the *Dictator*—a double turret Ericsson 350 feet in length, with a beam exceeding 50 feet—is also being urged forward with great energy, there being about 1,000 men employed upon her.

Besides these seven armor turret vessels, ranging from 200 to 350 feet in length, now in different stages of progress, W. H. Webb is also about to commence the largest iron-clad war vessel yet designed. Her length will be 360 feet, beam 78 feet. She will be 7,000 tuns, and have engines of 5,000-horse power. In addition to being furnished with two turrets she will have a common gun deck, and her accommodations will be as ample for her crew as those of a wooden frigate. Her plates are to be 4½ inches thick and she will be of light draft in proportion to her size owing to her great breadth of beam. A small iron clad is also being built at Jersey City for the defence of San Francisco harbor as a floating battery. She is being built in sections, which will be put together when she reaches her destination.

These vessels are all of the revolving-turret class, designed, we understand, by Captain Ericsson. The *Roanoke,* one of our wooden steam frigates, is now at the Novelty Works, having the remainder of her plates put on. She is of the *La Gloire* class, and will be a very efficient vessel, we believe. At the Dry Dock Iron Works, Mr. S. W. Whitney's novel armor gunboat, the *Moodna* is in a forward state. She will have two stationary gun turrets, and be propelled by two screws, driven by two pairs of powerful engines.

We have thus briefly enumerated no less than eleven armor war vessels now being built at this port for our navy. The smallest of these vessels will be a formidable war ship to encounter, but the three largest will be perfect leviathans, especially as they are to be armed with 15-inch Dahlgren guns—the largest in the world. They will all be capable of acting as rams also, but in this respect their efficiency will depend chiefly on their speed. And besides this large iron clad fleet for the American navy, two powerful iron-clad frigates are also being built by W. H. Webb for the King of Italy. The frames of both of these frigates are put together, and the planking of one is in a forward state. These two frigates will be of the *La Gloire* character, the framing being wood and the outside covered with 4½-inch plates. Each is about 280 feet in length with a beam of 55 feet. The sides will be no less than 33 inches thick—oak 28½ inches, the iron plates 4½ inches. The latter are to be made in France and sent out to be put on. Each frigate will have two fighting decks, the upper one being armed fore and aft with eight very large guns, the under deck with sixteen guns on each side. The construction of these two armor-clad war vessels in an American port, and by the designer and builder of the *General Admiral,* affords evidence of the esteem in which American shipbuilders are held abroad.

THE WAY THE VELOCITY OF CANNON BALLS IS MEASURED.

We recently had an opportunity of examining the instrument in use at West Point for measuring the velocity of cannon and musket shot, and we found it an exceeding ingenious piece of mechanism.

In front of a graduated arc, two pendulums are hung upon the same axle, one a little in front of the other, so that they may swing past each other. Each pendulum carries a block of iron near its lower end by means of which it is held in a horizontal position by an electro-magnet; one pendulum being raised up on one side of the arc, and the other upon the other side. The cores of the electro-magnets are made of the purest soft iron, so that when the circuit of electricity which passes along the wire around them is broken, they will be instantly demagnetized, and will consequently allow the pendulums to drop.

The wire from one electro-magnet is carried out of doors, and drawn repeatedly across a frame work target just in front of the muzzle of the gun; and the wire from the other magnet is drawn in the same way across a target at 100 feet greater distance. The gun is fired, and as the shot passes through the targets it cuts the wires of both circuits; allowing the pendulums to fall. But the wire near the gun is cut sooner than the one more distant, and, consequently, the pendulum which is supported by its magnet begins to fall sooner than the other pendulum. The pendulums therefore do not pass each other at the lowest point in the arc, but at a distance from the lowest point, which depends on the time occupied by the shot in moving from one target to the other.

The exact point on the arc at which the pendulums pass each other is indicated by a little prick made in the arc as the pendulums meet. To effect this the pendulum nearer the arc carries a pin pointing toward the arc, the outer end of the pin having a beveled head which is hit by a projection on the other pendulum as the two meet, driving the point into the arc.

The time occupied by the pendulums in making their oscillations is ascertained by careful observations, and then the time required for their passage through any portion of their arc is known by calculation. The instrument is always very nicely adjusted immediately before it is used, and the experiments must be conducted with the utmost thoroughness in every respect. When all the conditions are carefully complied with, the velocity of shot is probably measured with more accuracy by this instrument than by any other means yet devised.

The idea of using electricity for determining the velocity of projectiles was first suggested by Wheatstone in 1840, and a machine devised by Captain Navéz of the Belgian service was tried in this country, but was found too delicate and complicated for general use. The machine which we have described was designed by Captain J. G. Benton, late Instructor of Ordnance and Science of Gunnery, Military Academy, West Point. It is called the electro-ballistic machine.

EXTRAORDINARY PENETRATION OF ARMOR PLATES.

During the past week we have had a constant succession of visitors calling at our office to see some iron plates penetrated by a steel bolt which was driven through the plates by being discharged from a gun; and a great deal of wonder has been excited by the exhibition. There are twelve plates of boiler iron, each ⅜ of an inch in thickness, all pinned together by a bolt a little less than half an inch in diameter. The bolt weighs 7½ oz. and was fired from a gun of .492 inch diameter, with 4½ oz. of powder. A similar bolt from the same gun passed through two plates, each 2⅛ inches in thickness. These plates still remain on the desk at our office, and may be seen by any one interested in such matters.

We have a full description of the gun by which this extraordinary penetration was produced, but out of consideration for the interests of the Naval service we refrain from publishing it at the present time.

THE LONDON EXHIBITION—STEEL MANUFACTURE.

Never before has such a splendid collection of different specimens of steel been witnessed as in the Exhibition Building. Excepting the very small quantities of native steel made in Asia, all the finer qualtities, with limited exception in France, are manufactured in England. This is not owing to the possession of superior iron or coal for the purpose (because the best iron used comes from Sweden), but to acquired skill from long experience and careful manipulation. Steel differs from cast iron in being capable of forging and welding, and it differs from wrought iron in being capable of casting, hardening and tempering. It is the strongest metal in the world, and the best adapted for all kinds of cutting instruments. Steel is essentially iron containing a very small quantity of carbon—about one per cent—and a minute trace of nitrogen, which, some assert, gives it the peculiar quality of tempering.

Thus, if a piece of steel be heated, say to low redness, and then rapidly cooled by immersion in water, it is rendered extremely hard and brittle; but if this hardened steel be strongly reheated and afterward left to cool slowly, its original softness will be restored. In the process of reheating, the surface of the metal acquires a succession of well defined tints, beginning with pale straw and ending with deep blue, the former corresponding to the lowest and the latter to the highest temperature. If pieces of the same kind of steel be heated so as to acquire respectively this succession of tints, and then instantly plunged into water, they will be found to possess different degrees of hardness corresponding to the different tints. It is in this manner that steel is tempered. Steel is more fusible than wrought iron, and may be melted in ordinary furnaces, when it is termed cast steel. Steel may be welded to steel, or to wrought iron, under suitable conditions.

Two processes are employed in obtaining steel. One consists in extracting a certain quantity of carbon from pig iron; the other in adding a certain quantity of carbon to wrought iron. The finest steel is obtained by the latter process. The common method is by cementation, which consists in exposing flat bars of iron imbedded in charcoal to about the temperature of melted copper during many days. Carbon thus travels into the very center of the bars. The furnaces are termed "converting furnaces," and the bars produced are called "blister steel," from their being studded with blisters like protuberances. The other method of making steel by extracting some carbon from pig iron, consists in exposing melted pig iron to the action of a blast of atmospheric air at a high temperatue in a charcoal hearth. This has been called "natural steel;" and the process is quite old. Another method for producing what is called puddled steel, consists in blowing air through molten pig iron in a ladle, then adding some specular pig iron. The latter has been called the Bessemer process, and is practiced as follows:—

The melted pig iron is allowed to flow from an adjoining cupola furnace into the "converting vessel," which is a circular vessel of iron coated internally with a refractory lining of silica. Several jets of air are then blown in at the bottom and bubble up through the metal. The temperature gradually increases, and at length a small volcanic eruption suddenly occurs, melted scoriæ being projected on all sides with great violence. But soon all is again tranquil, and the chamber, it is asserted, contains malleable iron in a state of perfect liquidity. This may be tapped out into molds, and, with special precautions, drawn out into bars, &c.; but it is apt to be cellular and unsound.

Some spiegeleisen (specular pig iron made from Franklinite in Germany) is now introduced into the molten iron, in which it dissolves like sugar in water. This pig iron contains a known quantity of carbon, which is imparted to the molten iron, and converts it into steel. Iron which contains phosphorus cannot be advantageously converted into steel by this treatment. All that is used for the purpose is made from good hematite ores. Steel can also be made by melting granular pig iron with the oxide of iron in a crucible; also by melting scrap iron with charcoal powder, and some of the oxide of manganese in a crucible. All steel is called cast steel after having been melted.

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There are several varieties of steel in the Exhibition. Specimens of wootz or oriental steel, in the form of little conical ingots, are in the Indian collection. They are made from wrought iron fused with twigs of wood and charcoal on a small hearth. There are also specimens of steel called "homogeneous metal," which is very malleable and tough, and contains a low per centage of carbon. It occupies a position between wrought iron and ordinary steel. The barrels of Whitworth's rifles are made of this metal. Very strong tubes for boilers are also made of it. Although recently revived in England, it was invented and patented as claimed by M. Mushet in 1800, and is thus described :—"When iron is presented in fusion to 1-140th or 1-150th part of its weight of charcoal, the resulting product occupies a kind of middle state betwixt malleable iron and steel. It then welds with facility, and may be joined either to iron or steel at a very high welding heat. Thus combined with carbon it is still susceptible of hardening a little, but without any great alteration in the fracture. It possesses an uncommon degree of strength and tenacity, and is capable of an exquisite degree of polish, arising from its complete solidity and the purity of fracture conveyed to it by fusion."

Many samples of steel made by the process of cementations are in the English, French and some other departments of the Exhibition. In England, large quantities of Swedish iron are used in making steel, and different varieties of iron yield different qualities of steel. A knowledge of these differences is generally regarded as a trade secret. The iron for steel is all selected and arranged by experienced persons. They examine its grain, and are very careful in their selections. There were 170 English applicants for space to exhibit steel. Only one-half of this number has been accommodated. The largest Sheffield steel manufacturers have not sent specimens.

In articles of cutlery the English manufacturers believed they were unequaled in their wares, but in the most common articles of pen knives and table cutlery, the French beat them altogether; and with imported English steel, the French makers of surgical instruments have also surpassed the best in Sheffield. Messrs. Naylor & Vickers, of Sheffield, however, display cast-steel railway wheels and steel tires; also cast-steel bells, piston rods and axles, which in their classes are unequaled. Bessemer makes a great display of articles made of his steel, such as rails, tubes, wires and shafts. In the French department, Jackson, Son & Co., exhibit articles of steel made by the Bessemer process, and the Swedes have also sent both iron and steel treated by this system. The German steel is coarse; all the very finest specimens exhibited, excepting the wootz, were made at Sheffield.

TRIAL OF STEAM PLOWS.

An interesting trial with steam plows took place on the 5th of August, at York, England, before the County Agricultural Society. The furrows drawn were 330 yards in length; three steam engines were on the ground, stationed at the end of the field, and ropes and windlasses were employed to drag the plows. About one acre per hour was plowed by two of the plows, and the work was executed in a superior manner to plowing by horses, while the entire cost per acre was about thirty-three per cent less. The weight of the plows ranged from 500 to 700 lbs. in the furrows. One engine used was 8-horse power; it had a single cylinder of 9-inch diameter, and a stroke of 12 inches. It carried steam of 70-lbs. pressure, and the speed was 130 revolutions per minute. The second engine had two cylinders, each of 7-inch diameter, a stroke of 12 inches, steam pressure 70 lbs., speed 130 revolutions per minute, and the power was ten horse. The third engine was of fourteen horse power; it carried 75 lbs. of steam pressure, its two cylinders were 7¾ inches in diameter each, and the stroke 12 inches. Its speed was 180 revolutions per minute, and it plowed 1 acre, 1 rood and 5½ perches per hour, making four furrows, six inches in depth, at once. The smallest engine and plow required six attendants, the next ten-horse power engine, seven, and the largest only three men and two boys. Mr. J. C. Morton, from the Committee of the Yorkshire Agricultural Society, has made a report on the trial, and the following is given by him as the prices of the apparatus employed :—

	£	s.	d.
1. Fowler's 3-furrow plow, 800 yards of rope, 5-tined grubber, and rope porters, two anchors	295	0	0
8-horse power engine	235	0	0
2. Fowler's 14-horse power engine, 4-furrow plow, rope porters, 800 yards of rope, and anchors	875	0	0
7-tined cultivator	70	0	0
3. Howard's double windlass, 1,400 yards of rope and cultivator	220	0	0
3-furrow plow	50	0	0
10-horse power engine	295	0	0

These figures multiplied by 5 give us the prices in dollars.

VALUABLE RECEIPTS.

To Gild Steel.—Make a neutral solution of gold in nitro-muriatic acid (aqua regia) and pour into it a quantity of sulphuric ether; the ether will take up the gold and float upon the denser acid. The article is then to be washed with this auriferous ether (with a hair pencil); the ether flies off and the gold adheres.

To Silver Brass.—Take 1 part chloride of silver (the white precipitate which falls when a solution of common salt is poured into a solution of nitrate of silver or lunar caustic), 3 parts of pearlash, 1 of whiting and 1½ of common salt, or 1 part chloride of silver and 10 parts of cream of tartar, and rub the brass with a moistened piece of cork dipped in the powder.

Piercing a Hole in Glass.—The most simple method of making a hole in glass is, if possible, to pick out a place where there is a bubble in the glass. A very hard steel point is then taken, and worked round in the place, where it generally soon makes a hole down to the bubble, and by a repetition of the process the hole is completed, which is then enlarged at pleasure by a rat-tail file. Care must be taken that the file is smaller than the hole, for if it should stick in the hole the endeavor to disengage it would certainly crack the glass.

To Stain Pine Black.—The pine should be perfectly free from knots (as they will not color), and a strong solution of hot logwood rubbed carefully all over the board and then it is allowed to dry. Another coat may be given, or a number, according to the shade wanted. After the logwood is dried a solution of copperas should be applied in the same way as the logwood.

Poison Balls for Rats and Roaches.—Put a drachm of phosphorus in a bottle along with 2 ounces of water; cork it and plunge it into a vessel of boiling water till the phosphorus is dissolved, then pour it into a mortar along with 3 ounces of lard, and rub it briskly, adding some water, about half a pound of flour and 2 ounces of sugar. The whole is made into a paste and divided into balls about the size of marbles. This is laid down on the floor or shelves for rats, cockroaches or other vermin, who eat and are destroyed. For rats cheese is better than sugar, and tallow better than lard. The cockroaches are fond of anything sweet, hence sugar is a bait for them. Potatoes will answer as well as the flour. These balls should be laid down at night and carefully lifted in the morning, taking care not to let any be touched by a child. They should be locked up through the day.

To Remove Foul Air from Wells.—It is well known that many accidents occur to persons going down into wells to clean them, owing to the noxious gas in such places. To remove the gas before descent is made into any well a quantity of burned but unslacked lime should be thrown down. This, when it comes in contact with whatever water is below, sets free a great amount of heat in the water and lime, which rushes upward, carrying all the deleterious gases with it; after which descent may be made with perfect safety. The lime also absorbs carbonic acid in the well.

Permanent Ink.—Shell-lac, 2 ounces; borax, 1 ounce, distilled or rain water, 18 ounces; boil the whole in a closely covered tin vessel, stirring it occasionally with a glass rod or small stick, until the mixture has become homogeneous; filter, when cold, through a single sheet of blotting paper; mix the filtered solution, which will be about nineteen fluid ounces, with one ounce of mucilage of gum arabic, prepared by dissolving 1 ounce of water, and add pulverized indigo and lampblack, *ad libitum*. Boil the whole again in a covered vessel, and stir the fluid well to effect the complete solution and admixture of the gum arabic; stirring it occasionally while it is cooling, and after it has remained undisturbed for two or three hours that the excess of indigo and lampblack may subside, bottle it for use. The above ink for documentary purposes is invaluable, being, under all ordinary circumstances, indestructible; it is also particularly well adapted for the use of the laboratory. Five drops of kreosote added to a pint of ordinary ink will effectually prevent its becoming moldy.

Honey Comb Pudding.—6 cups of flour; 2 cups of beef suet chopped fine; 2 cups of milk; 2 cups of molasses; 2 cups of raisins; 1 cup of currants; 3 teaspoonfuls of soda and six of cream of tartar, a little salt. Boil three hours. Serve with wine or brandy sauce.

[This receipt was sent to us by one of our female subscribers.

Systematized Cattle Feeding.

The *American Stock Journal* states that there is no established system of cattle feeding in New England, but in Old England there is; and the following table of provender with the cost of fattening one bullock during winter is given by Mr. Blundell, who is an extensive English cattle feeder :—

Debtor.	s.	d.
To 4 lbs. of oilcake meal per day, or 28 lbs. per week at £12 per tun	3	0
To 1 lb. of bean meal per day, at £12 per tun	0	9
To 64 lbs. of mangold per day, or 448 lbs. per week at 10s. per tun	2	0
To 20 lbs. of oat-straw fodder per day, or 140 lbs. per week, at 30s. per tun	1	10
To 20 lbs. of straw litter per day, at 15s. per tun	0	11
To attendance per week	0	6
To interest on capital and gain	3	0
Total	12	0

Creditor.	s.	d.
By increased value of bullock per week	10	8
By value of manure per week	1	4
Total	12	0

The fattening of cattle has been a subject of experiment with Mr. Blundell for many years. The mangold which he feeds is but little known in America as a crop, yet Mr. Blundell states that can raise 30 tuns of mangold where he can raise only 20 tuns of Swedish turnips; and 64 pounds of mangold are equal to 75 pounds of swedes for feed. With respect to hay he says : "As to the 20 pounds of oat straw which he had put down for fodder, he had never yet seen one instance in which a bullock throve on hay. Observation had taught him that hay did not answer; first, because it cloyed the stomach, and next, because the animal did not continue to eat his food so well as when it had straw, and this was especially the case where a large quantity of roots was grown. During the summer months he cut up his clover and fed his beasts under cover, believing it was in that way they would prove most profitable. A ruminating animal required a large amount of straw to distend the stomach and keep up the process of digestion. He thought that the best age to commence fattening was from 18 to 20 months.

Mr. Hedley, in an article in the English *Agricultural Gazette* on the selection of cattle, says : "In my close identification with fat cattle for several years I have always found that the best animals have the most massive heads, the most capacious chests, and the strongest spines." American cattle-feeders have a great advantage over those in England in having such quantities of cheap Indian corn for feed, but this very abundance, we believe, has led them to become careless and unsystematic in feeding. There is nothing lost by adopting a good system, and while the above method of Mr. Blundell cannot be carried out in America as in England, a useful lesson may be derived from his remarks about hay for feed. In the Northern States and Canada hay is the great crop of the farmer for feeding his cattle during winter. According to Mr. Blundell it is very inferior food for cattle. Our farmers should make experiments to settle this question for themselves as it is one of very great importance.

A Praying Machine.—In the Indian department of the great exhibition is a red praying wheel from Thibet. The prayer is written on a piece of paper and fixed to the wheel, which revolves on a spindle held in the hand. The idea of the worshipper is that every time the wheel turns the prayer is made. Frequently the wheel is fitted to be turned by a small stream. In the mountains of Thibet travelers see considerable numbers of these praying machines thus driven by water power.

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Frictional Grooved Gearing.

We have recently published several interesting articles on the above named subject, from American correspondents who had made and used the frictional gearing. The following is from *The Engineer*, and it throws considerable new light on the application and utility of such gearing in Great Britain. It says :—

In the western passage of the western annexe will be found a steam winch, exhibited by the Patent Frictional Gearing Company, of Glasgow, which will well repay inspection. As most of our readers are probably aware, the frictional gearing is intended as a substitute for toothed wheels of every description, a few, we think, who examine the working of the wheels can doubt that the improvement is very great. The mode by which the motion is communicated is extremely simple ; the peripheries of the wheels are provided with continuous and endless Λ-shaped grooves, the extreme points of the Λ being removed to insure a good bite, and each Λ fitting into the recess formed between two W on the other wheel ; the smallest possible pressure is thus made to give a very large amount of force. It is calculated that the adhesion or driving hold of the surfaces of these grooved wheels is about nine times that of plain surface frictional wheels. When working at 1,000 circumferential feet per minute the contact pressure requisite for transmitting a standard horse power is 22 lbs. ; at double that circumferential speed, 11 lbs. ; and in the same relative proportions at other speeds ; a wheel 8 feet in diameter, working at forty revolutions per minute, gearing with a pinion, requiring about 1 tun of contact pressure to transmit 100 indicated horse power. This system of gearing seems to be thoroughly adapted both to heavy and light machinery ; and wherever there is liability to sudden concussion or strain they are invaluable, since, from their very principle, it is evident that they cannot be damaged ; for, in case of a sudden jerk, a slight and immaterial slip is the sole inconvenience, the wheels being left in quite as good order after the jerk as they were before, instead of, as would be the case with ordinary teeth gearing in use, broken teeth having to be repaired before the working could be continued. The smoothness with which the frictional gearing works is remarkable. Some of the wheels upon this system have been in use more than four years, and continue to give the greatest possible satisfaction ; and it is considered that where the wheels are properly proportioned to the work to be done they are more durable, and transmit power with less waste by friction than is incurred by using toothed gear. As an evidence of the advantages derived being really of a practical character, it will suffice to state that this system of gearing has been adopted by many of the principal ironmasters, manufacturers, and others in Scotland and South Wales, and with such satisfactory results that many of them have given permission for the gearing to be examined at their works in operation. Even for such heavy work as the rolling of iron the grooved wheels have been found applicable ; and in their application to heavy and light rolling purposes they may be seen in use at the works of Messrs. Sharp and Brown, Birmingham ; of the Dundyvan Iron Company, Coatbridge ; of Messrs. William Baird and Co., Muirkirk ; of Messrs. Strang and Hamilton, Glasgow ; of the late Mr. Anthony Hill, Merthyr Tydvil ; and at several other places. The wheels have also been employed as screwing rolls for straightening bars and tubes, for winding engines, for steam cranes, as well as for driving fans, circular saws, rotary pumps, &c.

Sponges.

Sponges belong to the lowest class of animals ; a creature which may be said to form the first link in the great chain of life which ends with man. This microscopic protozoon is by no means unfrequently to be met with in stagnant waters and vegetable infusions. It is a minute semi-fluid mass, presenting scarcely any evidence of distinct organization, even of the simplest kind. When the creature, in the course of its progress, meets with a particle capable of affording it nutriment, its gelatinous body spreads itself over and around the precious morsel so as to envelop it completely. The substance thus taken into this extemporized stomach undergoes a sort of digestion, the nutritive material being extracted, and the indigestible part being, as it were, squeezed out of the body. Of the mode of its reproduction nothing yet is known, save that it undergoes multiplication by self-division, and that portions separated from the mass, either by cutting or tearing, can develope themselves into independent beings. This living speck of jelly, which can get along without legs, and which can convert any portion of its substance into a stomach, may be regarded as the type of the Protozoa.

In the living sponge the skeleton, usually composed of a fibrous network, strengthened by spicules of mineral matter, is clothed with a soft flesh. Most sponges are strengthened by calcareous or siliceous spicules, and the variety of forms presented by these bodies is almost endless. In the ordinary sponge, *spongia officinalis*, the fibrous skeleton is almost entirely destitute of spicules ; but in the curious and beautiful sponge of Barbadoes the entire network of fibers is composesed of silex, and is so transparent that it looks as if composed of spun glass.

With the exception of those that belong to the genus *Spongilla*, all known sponges are marine, but they differ very much in habit of growth ; some are only found at considerable depths, others live near the surface, and many attach themselves to rocks and shells between the tide-marks. The average depth at which the best Turkey sponges are found is thirty fathoms ; those of an inferior quality are found at lesser depths.

All the finer descriptions of sponges are obtained from Islands in the Mediterranean, and the coarser descriptions from the Bahama banks and the coast of Florida. About one thousand bales, each weighing 300 lbs., are shipped annually from Nassau, New Providence. Sponge fishing is also carried on at Key West, in Florida, where about 100,000 lbs. are gathered annually. Our great source of sponges, however, is the Bahamas.

The Andros Islands and the Cays are the great sponging districts. The sponge is usually found in grassy and rocky patches near the shores of this group. Crawls for cleaning these may be seen, constructed with stakes about two inches thick, driven into the mud, and forming a square of twelve feet, sufficiently high to prevent the sponge washing out. In these the sponge is soaked and washed frequently, after having been buried in sand about a week or ten days, when it loses the black animal matter, which has an offensive smell. When first gathered the pieces are wrenched from the rocks with a strong two-pronged fork fixed to a long pole. The sponges are of four kinds—yellow, glove, velvet and mop. The first is the most valuable kind ; the second is the toughest, and much used in stables for its softness.

In 1859, 207,450 pounds of Bahama sponges were imported into the United States. At Nassau, New Providence, it may be seen in vast quantities on clear days spread on the roofs of houses, and hung upon fences to dry. All the sponges which are hawked around our streets for sale, either come from Key West or Nassau.

Trial Trip of the Black Prince.

[From Mitchell's Steam Shipping Journal, August 29.]

The official trial of the speed of the *Black Prince*, at full power, at her deep draught of water for sea service, commenced at Portsmouth on the 26th inst., under the most favorable circumstances of wind and weather. The two previous trials of the ship took place at light draught, and under somewhat exceptional circumstances, the first only being a trial of speed, made on the day after her arrival at Spithead from Greenock, on the 20th of November, 1861. The second was her trip outside the Wight, to test the action of her enlarged rudder, in April last. In her speed trial she made four runs at the measured mile, with the following results in knots :—First run, 15·859 ; second run, 12·950 ; third run, 15·319 ; and fourth run, 13·043. Some disappointment was felt by many at the time at this rate of speed, the *Warrior* having exceeded it on her trial at deep draught, when she averaged 14·354 knots. The ship's draught of water on the 20th of November was 24 feet 2 inches aft, and 21 feet 10 inches forward. The second trail (not of speed) took place in April last, to test the capabilities of her rudder, which had been enlarged from an area of 130 feet to 153 feet. On this occasion she had 12 men at her wheel, and, taking three of the circles completed by the ship as the average of the whole, they were made respectively in 8′ 5″, 9′ 49″ and 9′ 38″—the angle of the rudder being in each case 16°, 13° and 13°. The ship's draught of water was—forward, 22 feet ; aft, 23 feet 1 inch. The *Black Prince* is now, however, in commission, with her stores on board and ready for sea, and made her trial of speed on the 26th inst., on equal terms with her sister ship the *Warrior*, tried on the 17th of last October. An auxiliary engine has been fitted of 40-horse power for working the capstan, pumping water from the different compartments, washing decks, and also to act as a fire engine. A cupola furnace and fan has been erected for molten iron shell. Tramways in coal boxes and stoke holes, with engines for raising ashes, &c., and feed engine for the auxiliary boiler, have also been fitted. The ship's upper deck presents a fine roomy space to the eye. Here she carries two 110 pounder Armstrongs, four 40-pounders and two 20-pounders, also Armstrongs, besides rifled and smoothbore guns for boat service. On the main deck she carries, in the two compartments, forward and aft of her armor plating, eight 110-pounder Armstrongs—four in each compartment. Behind her armor plating all the guns are the 95 cwt., smoothbore, for 68 pound solid shot, mounted on carriages fitted with directing bars. Four runs were made with the following results :—

	Time. min.	sec.	Speed in knots.	Revols. of engines.	Steam	Vacuum for.	aft.
First run.....	4	21	13·846	47·5	20lb.	25	23
Second run.....	5	58	10·055	49	20lb.	25	23
Third run.....	4	9	14·457	49	20lb.	24	23
Fourth.....	5	50	10·286	59·5	20lb.	24	23

Mean speed of the four runs 12·209. This result was so unsatisfactory, as compared with the *Warrior's* trial, that ship having attained a mean speed of 14·354 knots, that it was resolved to abandon any further trial of speed, and to recommend to the Admiralty that the ship should be taken into Portsmouth harbor, and placed in dock to clean her bottom, and that the weight on her safety valve should be increased to a level with that given to the *Warrior* on her trial trip, the *Black Prince* having been worked with five pound less than the *Warrior*. The screws of both ships are precisely similar improved Griffith's, and set at the same pitch ; the draught of water of the two vessels was, however, different, and against the *Black Prince*, whose draught was 26 feet 10 inches aft, and 26 feet 2 inches forward, the *Warrior* drew 26 feet 5 inches aft, and 25 feet 6 inches forward.

Testing Butter.

Mr. John Horsley, analyst to the County of Gloucester, England, in an article in the *Chemical News*, recommends as a method to distinguish between pure butter, and that adulterated with lard and other substances, the following process :—

First satisfy yourself, by melting a portion of the suspected butter over a water bath, and observing if there be any insoluble admixture of farinaceous matter, such as wheat flour, potato starch, arrow root or turmeric (said to be sometimes used), which the microscope and chemical tests will prove ; then mix the melted butter in an evaporating dish with four or five times its bulk of hot water, and allow it to stand for two or three hours to collect on the surface and solidify. Detach the resulting cake of butter, and place it on a piece of blotting paper to dry, by the absorption of all adhering aqueous matter. If a piece of this prepared butter be introduced into a wide-mouth stoppered bottle, and surrounded with ether, at the temperature of 65° Fahr., it ought to entirely dissolve, forming a clear lemon-yellow colored liquid.

English Cupola Frigate.

The Board of British Admiralty has fully approved the model of an improved armor-plated cupola vessel by Mr. Turner, master shipwright at Woolwich Dockyard ; and one of these vessels is ordered to be constructed. The iron cupola will be fixed instead of movable, 200 feet long, 50 feet broad, and 10 feet deep. Guns will be placed round the vessel from fore to aft, and will be able to sweep the water at such a depression that no gun vessel can approach. She will be fitted with a ram 3 feet under the surface of the water, 8 feet long ; and her rudder tiller and propeller will be under the water. The ship will carry 26 guns ; and her dimensions will be as follows :—330 feet long, 64 feet broad. 25 feet draught, and 8,700 tuns displacement.

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RECENT AMERICAN INVENTIONS.

The following are some of the most important improvements for which Letters Patent were issued from the United States Patent Office last week. The claims may be found in the official list :—

School Globes.—This invention consists in mounting two hemispheres in armed standards, which slide in parallel places toward or from each other in such a manner that on separating them the several parts or lines marked on their inner and outer surfaces retain their relative position opposite to each other. It consists further in the arrangement of a primary pedestal provided with a series of screw sockets in combination with a screw shank projecting from the lower end of the head, in which the armed standards of the hemispheres slide, in such a manner that one or more globes can be placed on the primary pedestal or taken from the same and returned to their original pedestals at pleasure. It consists also in combining with the sliding armed standards, slotted swivel socket in such a manner that the globe can be turned freely in either direction. John R. Agnew, of Mercersburg, Pa., is the patentee of this invention.

Lamp Burners.—This invention consists, first, in a novel and improved means for securing the draught chimney to the burner, whereby the chimney may be attached to the burner and detached therefrom with the greatest facility and the chimney allowed to expand freely as it becomes heated by the flame of the lamp so as to prevent breakage from that cause ; second, in an improved filling attachment, arranged in such a manner that the fountain of the lamp may, when necessary, be supplied with oil without detaching the burner from the lamp ; third, in an improved means employed for raising and lowering the wick, whereby the latter is not subjected to any undue pressure which would tend to check the ascent of the oil and the wick tube not rendered liable to be forced apart, contingencies which frequently occur in using the ordinary burners ; fourth, in the employment of an indicator arranged in such a manner as to show the amount of oil in the lamp, so that it may be supplied or replenished when necessary—a desideratum in the use of metal lamps. C. B. Matthews, of Oquawka, Ill., is the inventor of this improvement.

Zinc-White Paint.—Zinc-white paint has been ordinarily manufactured by grinding the white oxide of zinc in oil without any previous preparation beyond levigation, and its want of what is termed by painters "body" has been much complained of. The object of this invention is to enable the white oxide of zinc to be manufactured into paint having a desirable degree of body, and to this end it consists in subjecting the said substance in its dry state to the combined actions of friction and pressure, by which means its bulk is greatly reduced and it is enabled to be ground with a much smaller quantity of oil. This improvement is the invention of George T. Lewis, of Philadelphia, Pa.

Folding and Stitching Paper.—This invention consists in the arrangement of a stitching device and pressing or smoothing rollers and of a series of folding blades in such a manner that a piece of thread is drawn through each sheet of paper before the last fold is completed, and that when completely folded each sheet is passed by the action of a pair of take-off rollers through the smoothing or pressing rollers, from which it is discharged ready for the binder. S. H. Tanner, of Frauenfeld, Switzerland, is the inventor of this device.

THERE are 2,800 streets in London, which, if they were placed in a straight line would extend 3,000 miles, or twice the distance from Calais to Constantinople. If a person should undertake to walk through all these streets, and should go ten miles a day, each working day, it would require a whole year, and meanwhile a new city, with from 60,000 to 70,000 inhabitants, would be built.

AN anvil block for a steam hammer lately cast at the Port Richmond Iron Works, near Philadelphia, weighs 31 tuns. The quantity of air used in the blast to smelt it was 4.000 cubic feet per minute, and one pound of coal was used for every pound of iron melted. About 37½ tuns of pig metal, for the casting, were melted in four hours in one cupola, and the mold was filled in 4½ minutes.

ISSUED FROM THE UNITED STATES PATENT OFFICE

FOR THE WEEK ENDING SEPTEMBER 9, 1862.

Reported Officially for the Scientific American.

*** Pamphlets giving full particulars of the mode of applying for patents, under the new law which went into force March 2, 1861, specifying size of model required, and much other information useful to inventors, may be had gratis by addressing MUNN & CO., Publishers of the SCIENTIFIC AMERICAN, New York.

36,387.—J. R. Agnew, of Mercersburg, Pa., for Improvement in School Globes :

I claim, first, The arrangement of the armed sliding standards or supports, D, in combination with the hemispheres, A A′, constructed and operating substantially as and for the purpose shown and described.

Second, The arrangement of the primary pedestal, F, provided with a series of screw sockets, in combination with the screw shank of the head, C, and with the armed standards, D, and hemispheres, A A′, constructed and operating substantially as and for the purpose set forth.

Third, The slotted swivel sockets, d*, in combination with the head, C*, constructed and operating substantially in the manner and for the purpose specified.

36,388.—Sarah A. Baldwin, of Waterbury, Conn., for Improvement in Door Plates and Card Receivers :

I claim the combination of the door plate, A, reversible slide, B, and card receiver, C, arranged substantially as and for the purpose herein set forth, also

The clamp, D, when applied to the door plate, A, and used in connection with the card receiver, C, for the purpose specified.

[This invention consists in combining a door plate and slides with a card receiver and a clamp, arranged in such a manner that a visitor may be informed whether the occupant of the house is at home or not, and in case of not being at home, admit of the card of the visitor being deposited within the receiver, so that the occupant may obtain a knowledge of the call when arriving at home; the invention also admitting of the application of the card or address of any individual member of the house to indicate his or her absence.]

36,389.—Cortland Ball, of Augusta, Mich., for Improvement in Hammers :

I claim the within described tool as an article of manufacture, constructed and used as and for the pur ose herein specified.

36,390.—Uriah Billings, of New Bedford, Mass., for Improvemont in Machines for Making Horseshoes :

I claim my improved horseshoe blank former, or combination of the adjustable, swaging and creasing rolls, I K L, and a moveable buttress, N, constructed and applied, and arranged together, and with mechanism for operating them, substantially as herein before described.

36,391.—J. P. Blake, of Waterbury, Conn., for Improvement in Making Sewing-Machine Needles :

I claim the method of making sewing machine needles by machinery, which elongates the portion of the wire which is to form the body of the needle, thus reducing it in diameter and extending it in length, substantially as described.

36,392.—J. P. Blake, of Waterbury, Conn., for Improvement in Machinery for Making Sewing-Machine Needles :

I claim the combination of rolls fitted with grooves alternately flat and octagonal, for the purpose of reducing the transverse dimensions of metal rods and elongating them in length, substantially as described.

I also claim the combination of rolls, having a groove with an enlarged space of sufficient size to permit the butt of the piece of metal, whose dimensions are to be reduced, to be introduced between the rolls, with a gage which determines the longitudinal position of the rod or other piece of metal before the rolls begin to bite upon it, substantially as described.

I also claim the combination of rolls grooved, substantially as described, with gages to determine the positions of the rods of metal, and with guides which hold the rods edgewise when the rolls begin to act upon them.

36,393.—J. S. Brown, of Washington, D. C., for Improvement in Addressing Letters :

I claim the envelopes made transparent or equivalent, prepared so as to receive and properly exhibit the cards of address, substantially as and for the purpose herein specified.

I also claim the combination of the cards of address and the transparent or equivalent envelopes, substantially in the manner and for the purpose herein specified.

36,394.—E. A. Cone, of Milford, Mich., for Improved Clothes Pin :

I claim making clothes pins of two pieces of wood of the form herein specified, and two pieces of wire which serve the double purpose of holding the pieces, A A, together at a proper distance, and as springs to allow the two ends to open and close as described, the pin when finished having both ends fitted for the line, in the manner specified.

36,395.—Frederick Dayton, of Watertown, and W. S. Kelly, of Waterbury, Conn., for Improvement in Stereoscopes :

I claim, first, A stereoscope case, A, provided with a clock movement, H, and a continuous sheet, B, of stereoscopic pictures, so arranged that the sheet will be actuated or moved by the clock movement, and the pictures made to pass before the lenses of the case, substantially as set forth.

Second, The sliding bar, E, arranged in the relation as shown with the journal, e, of the lower roller, C, of the sheet, B, and having one of the journals of the shaft, i, of the upper roller, D, fitted in it, whereby the pinion, J, on the shaft of roller, D, may be detached from the clock movement, so that the sheet, B, may be wound on the lower roller, C, by simply placing the key on the journal, e, of roller, C, as set forth.

Third, The rod or stop, K, in combination with the clock movement, H, as and for the purpose specified.

36,396.—Henry Dunham, Jr., of Abington, Mass., for Improvement in Machines for Sewing Soles to Boots and Shoes :

I claim the combination of the covered and hooked needle with the last, constructed with a concave bottom, the whole being substantially as described and represented.

I also claim the combination of the last holder with its carrying plate, in such a manner as to enable the former to be inclined with respect to the latter, substantially in manner and as set forth.

I also claim the above described arrangement of the feeding mechanism with respect to the last-carrying plate supporter, M, and the sewing mechanism.

I also claim a curved awl and a curved hook needle, arranged and combined with a guide wheel, G, and a last having a concave bottom, the whole being in manner substantially as specified.

36,397.—Lovett Eames, of Kalamazoo, Mich., for Improved Hydraulic Apparatus :

I claim, first, The piston, J, working in an upright cylinder, A, and so constructed that it will be acted upon in its upward stroke by the force of a head of water, and then allowed to descend by virtue of its own gravity, when the head is cut off, substantially as herein set forth.

Second, The water chest or divisional box, E, arranged below the main piston, J, at the bottom of the body of the machine, and furnished with a double disk valve, F, valve seats, f and c′, and eduction chambers, substantially as herein set forth.

Third, Controlling and regulating the passage of the spent water below the piston, through said piston, by means of a loaded plate valve, H, or its equivalent, substantially as herein set forth.

Fourth, Cutting off the pressure under the piston, and its loaded valve at the instant the water has exerted its maximum force upon the piston, by means substantially as herein set forth.

Fifth, Arranging above the piston, J, a force pump, when this pump receives its power from, is connected to, and operates in combination with the mechanism in the body of the machine, substantially as herein shown.

Sixth, The central equalizing chamber which is immediately above the double valve, F, for regulating the flow of water to the piston, J, at the commencement of its upward stroke, substantially as herein set forth.

Seventh, Tripping the valve, k, by means of the extension jointed levers, l l, or their equivalents, as herein set forth.

Eighth, Cutting off the supply of water to the chamber, A, previously to the tripping of valve, k, by means of rod, K′, and double valve, F, so that the double valve, F, can be driven firmly to its seats by the force of the head of water, essentially as set forth.

36,398.—Lovett Eames, of Kalamazoo, Mich., for Improved Water Engines :

I claim, first, So constructing and applying valves to a water engine that they will control both ports, and keep a space equal to the whole of one port open at all the time, essentially as herein described.

Second, The solid double-faced valves, L L′, in the cylinder, G, valve seats, h h′ i i′, and ports, g g′, arranged and combined with the cylinder, A, and its piston, E, substantially as and for the purposes herein set forth.

36,399.—R. B. Fitts, of Philadelphia, Pa., for Improvement in Treating Night Soil :

I claim the method or process of treating and putting up night soil, for transportation and agricultural purposes, substantially as described.

36,400.—Louis Friese, of Stuttgart, Germany, for Improvement in Riding Saddles :

I claim the combination of the hinged links, C, plates, B D, bow, E, and cantel, F, in the manner herein shown and described.

[This invention consists in the peculiar construction of the frame of the saddle, each side of which consists of three distinct parts, to wit, the front plate, the back plate and the central connecting link, that are united to each other by hinges in such a manner, that the same are permitted to accommodate themselves freely to the motions of the rider and of the horse, and that a galling of the horse is avoided.]

36,401.—G. P. Ganster, of New York City, for Improvement in Breech-Loading Ordnance :

I claim the eccentric breech pin, B, constructed and operating substantially as described.

36,402.—R. J. Gatling, of Indianapolis, Ind., for Improved Steam Marine Ram, &c. :

First, I claim arranging and combining the ribs, b b, and transverse frame timbers, c and d, and vertical frame timbers, i, side by side, so as to form continuous bearings against each other, anteriorly and posteriorly, the same being halved or dovetailed together at their crossing, which arrangement allows the lower parts of the rib timbers to rest on and form a crotchet over the keel, as shown in Fig. 3.

Second, I claim the ◁ or crotchet-shaped metal bow shields, f f f f f f, constructed, arranged and combined substantially as described for the uses and purposes set forth.

36,403.—C. W. Grannis, of Gowanda, N. Y., for Improved Condenser for Coal-Oil Stills :

I claim a condenser which combines,

First, Sloping sides.

Second, An internal trough to catch and conduct the condensed vapors to an external conductor.

Third, An external spout or conductor passing through or in a trough of cold water, to conduct the condensed vapors to the worm or cooler.

Fourth, Jets of water or a body of cold water upon its outside, in combination with a caldron or still having a broad open top, upon which the condenser is fitted, forming a cover thereto, so that the vapors arising from the entire surface of the oil in the still may pass directly to the condenser, substantially as described.

36,404.—J. S. Gray, of New York City, for Improvement in Self-Generating Vapor Burners :

I claim the combination of a wick tube, a heater cap, a conductor, a jet and a mixing tube, when arranged and operating substantially in the manner herein described.

I also claim the combination of a jet, a mixing tube and an adjusting screw, when arranged and operating as described, for the purpose of regulating the relative proportions of air and vapor admitted to the burner tip, as set forth.

36,405.—W. O. Grover, of West Roxbury, Mass., for Improvement in Sewing Machines :

I claim, first, Giving a vibrating motion to a thread carrier, in directions perpendicular to its advancing and retreating motions, or nearly so, by means of a revolving surface, inclined to a revolving shaft, the thread carrier stock being forced against that surface, and the contrivance acting substantially as specified.

Second, I claim giving four motions to a thread carrier, by means of an inclined revolving surface, a pin or sleeve, and a pivot, the whole either acting on the stock or controlling its motions, substantially as specified.

Third, I claim, in combination with a thread carrier having four motions, a stationary assistant looper, substantially such as described, the two acting in combination, substantially in the manner set forth.

And, lastly, I claim in combination a vibrating thread tension, a stationary thread tension, and an eye or leader on a needle arm, when the three are relatively arranged and act in combination, substantially as described, for the purposes specified.

36,406.—Robert Haering, of New York City, for Improved Composition Substitute for Horn, Hard Rubber, &c.:

I claim the composition made by mixing the changed linseed oil with asphalt, sulphur and gutta percha, in the manner and in about the proportions herein specified.

[By treating linseed oil with protochloride of sulphur, a peculiar elastic gummy substance is obtained. This invention consists in compounding and masticating this substance with asphalt, and with small quantities of gutta percha and sulphur, and rolling, molding or otherwise forming the compound into suitable forms and subjecting it to heat.]

34,407.—John Hardick and C. B. Hardick, of Brooklyn, N. Y., for Improvement in Valves for Steam Engines :

We claim the stationary piston, g, in combination with the cylinder, e, formed with or attached to the valve, b, substantially as and for the purposes specified.

We also claim the disks, k k, and annular recesses, l l, in combination with the said valve, b, and cylinder, e, to cushion the valve and prevent concussion, as set forth.

36,408.—Samuel Horsley and E. H. Jones, of Liverpool, England, for Improved Apparatus for Cleaning and Polishing Boots and Shoes :

We claim the combination with the rotary brushes or buffers, h and i, of the disks or rollers, n, and fulcrum and crank-lever spindles, o and p, for supplying the cleaning substance or blacking from the troughs or receptacles, l, substantially as herein described.

36,409.—Albert Johnson, of Putnam, Conn., for Improvement in Water Elevators :

I claim the crank box, E, placed loosely on the shaft, C, and provided with the slide or brake, H, spring, I, pulley, e, and bar, L, in connection with the wheel, D, attached permanently to the shaft, C, and placed within the crank box, all being arranged to operate substantially as and for the purpose set forth.

I further claim the graduating of the pressure of the slide or brake, H, on the wheel, D, by means of the bar, J, adjusted by the screw, K, so as to regulate the strength of the spring, I, but this I claim only when used in combination with the crank box, E, and the mechanism contained within it, for the purpose specified.

[The object of this invention is to obtain a well windlass of simple and economical construction, by which the bucket may be raised with

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facility, and allowed to fall at any time or from any point, at the will of the operator, and without a reverse movement of the crank.]

36,410.—E. B. Jucket, of New Haven, Conn., for Improvement in Hose Couplings:

I claim the conical screw ring, D, and nut, E, constructed substantially as described, in combination with hose couplings, in the manner and for the purpose substantially as herein set forth.

36,411.—C. W. T. Krausch, of Chicago, Ill., for Improvement in Engine Indicators:

I claim the indicator and recorder, constructed and operated substantially as described, for the purpose of making a combined record of the performances of an engine.

36,412.—Jacob Kritsch, of Binghamton, N. Y., for Improvement in Securing Boxes to Wheel Hubs, &c.:

I claim the arrangement of the perforated flanch, d, with the screw bolts passing through it, in combination with the screw c, upon the exterior of the box, B, so that by unscrewing the box access may be had to the inside of the flanch, for the insertion or removal of the screw bolts as herein shown and described, for the purpose set forth.

36,413.—William Kuebler and Henry Beierlein, of Philadelphia, Pa., for Improvement in Lamps:

We claim the described burner for coal oil lamps without a chimney, in which the gas-condensing chamber, d, is provided with an internal bottom flange, g, the position of g and its proportionate size of opening being in relation to the wick, arranged as set forth.

We also claim the slitted gas condenser, d, combining with the internal bottom flange, g, the slitted top as set forth, when the slit, l, is shaped and situated in relation to the slit, v, in the draught chamber, e, as herein set forth.

36,414.—G. T. Lewis, of Philadelphia, Pa., for Improvement in the Preparation of White Oxide of Zinc for Use in Paints:

I claim the preparation of white oxide of zinc for the manufacture of paint, by subjecting it to the combined actions of friction and pressure, substantially as herein described, whereby its density is increased and the paint caused to have greater "body."

36,415.—Adolphus Lind, of San Francisco, Cal., for Improvement in Water Wheels:

I claim the employment of two sets of buckets, c c d d, and separating flange, C, in combination with the drum, A, and the drum, E, recessed to receive said buckets; the said parts being arranged and operating together in the manner herein shown and described.

[This invention consists in having brackets placed on the periphery of a drum, which is fitted within a cylindrical case, and used in connection with a cylindrical abutment, which is placed in contact with the drum and provided with recesses to receive the buckets of the wheel; the abutment being also placed within a case and all arranged with a view to admit of the ready discharge of the water after acting upon the wheel, so that the latter will not be retarded in its movement, or have its efficiency diminished by carrying the water when the velocity of the latter diminishes.]

36,416.—R. J. Marcher, of New York City, for Improved Device for Cutting up Composition Ornaments used for Picture and Mirror Frames, Architectural Purposes, &c.:

I claim the stock, A, formed of two side pieces, a a, connected by rods, b, or their equivalents, and provided with a screw rod, B, and thumb nut, C, in connection with the knife or planer, D, fitted in the stock, A, substantially as shown and described, and all arranged to be used with, or applied to the bed or base of the ornament, for the purpose herein set forth.

36,417.—C. B. Matthews, of Oquawka, Ill., for Improvement in Lamp Burners:

I claim the arrangement of the spring, D, with the lamp top, A, cone, C, and chimney, E, in the manner herein shown and described, so that the said spring will adjust itself, both vertically and laterally, to the chimney, and press the chimney with a yielding pressure in both directions, all as set forth.

I also claim having the wick fork or spur wheel shaft mounted upon a spring, in the manner and for the purpose herein shown and described.

36,418.—I. F. Maynard, of Nashua, N. H., for Improvement in Spinning Fliers:

I claim the construction of a roving or spinning flier, formed with an interlocking base or pedestal collar, f f g g, and provided with a keying or interlocking tenon, d e d e, and whirl, C2 C2, or a gear connection, C C, substantially as herein described, and as fully exhibited in the accompanying Figures, 1 2 3 4 5 6 7 8.

36,419.—Antonio Meucci, of Clifton, N. Y., for Improvement in Treating Petroleum and Other Oils to Produce a Vehicle for Paints and Varnishes:

I claim, first, The employment or use of hyponitric acid, in treating petroleum, kerosene or other oils, substantially in the manner and for the purpose described.

Second, Mixing petroleum or other oils, after they have been exposed to a current of hyponitric acid as described, with linseed or with linseed "cakes" and fish oil, substantially in the manner and about in the proportions herein specified.

[The invention consists in rendering petroleum and kerosene, or other liquids, fit to be used in paints, by the introduction of a current of oxygen gas or of any other gas or liquid containing oxygen and capable of parting with the same, and it consists also in mixing with petroleum and kerosene or allied liquids, an extract of the cakes obtained in the manufacture of linseed oil or of farina of linseed for the purpose of giving to said liquids the required consistency to render them fit to be used in paints.]

36,420.—T. V. Nichols, of Olena, Ill., for Improved Hedge-Trimming Device:

I claim the horizontal knives, c, of cylinder, K, for cutting or trimming the top surface of the hedge, in combination with the knives, d d, attached to the ends or disks, b b, of the cylinder, for trimming the sides of the hedge, said cylinder being connected to a shaft, I, placed on a mounted frame, A, and driven from the wheel, B, thereof, substantially as described.

[The object of this invention is to obtain a machine by which hedges may be trimmed at the top horizontally, and at each side perpendicularly or at an inclination, at one operation.]

36,421.—M. T. Ridout, of Milwaukie, Wis., for Improvement in Pad Locks:

I claim the combination of the bolt, D, with the spring, s, the angular stud, the tumbler, d, and the main spring, g, substantially in the manner and for the purpose herein set forth.

I also claim the arrangement of the tumbler, f, with the keyhole cover, a, the cam, b, the spring catch, i, the stop, k, and the bolt, D, or its equivalents, of said parts, substantially in the manner and for the purpose herein set forth.

I also claim the arrangement of the curved guard plate, h, with the tumbler, f, the spring catch, i, and key pivot, q, substantially in the manner herein set forth.

36,422.—E. S. Ritchie, of Brookline, Mass., for Improvement in Mariners' Compasses:

I claim the arrangement and combination of the air vessel, E, with the magnet or magnets, G.

I also claim the combination of the said air vessel and magnet or magnets, with the cards, D, the same being for the purposes as specified.

36,423.—John Robinson, of New Wilmington, Pa., for Improvement in Machine for Holding Open Bags and Sacks:

I claim the bag holder, constructed substantially as described, of the arms, h h′, pivoted to a handle, d, projecting from a standard, b, whether so arranged as to be adjustable to any hight or not.

36,424.—S. J. Seely, of Brooklyn, N. Y., for Improvement in the Manufacture of Corrugated Plates:

I claim making corrugated iron plates for ships' armor, or other purposes, when, by reason of the irregularity of form or the thickness of metal required, such plates cannot be produced by rolling wrought iron, by first casting said plates, and then subjecting them to the process required to change them to the condition known and distinguished as malleable iron.

36,425.—J. S. Swan, of Mongaup Valley, N. Y., for Improvement in Holdbacks for Wheeled Vehicles:

I claim the arrangement of the levers, F F′, and slides, b b′, in combination with the cords or chains, d e, all applied to a wheeled vehicle, and operating in the manner shown and described.

[This invention consists in the arrangement of the hinged levers connected to the truck frame or perch of a carriage or other wheeled vehicle, by means of pivots or in any other desirable manner, in combination with two lines or chains, one connecting to a hinged segment, for the purpose of raising the levers from the ground, and one connecting with the straps of the horses or draught animals, in such a manner that in going uphill, if the vehicle begins a retrograde motion, and the hinged levers are lowered, the strain of the horses forces them to bear hard on or to penetrate the ground and to hold the vehicle firm in its place, and, at the same time, the progress of the vehicle can be stopped whenever it is desired.]

36,426.—J. H. Shireman, of East Berlin, Pa., for Improvement in Horse Rakes:

First, I claim suspending the hand lever, N, upon the axle, B, so that the former may articulate upon the latter, in the manner and for the purpose described.

Second, I claim the inclined "way," k, in combination with the hand lever, N, arranged and operating substantially in the manner and for the purpose set forth.

Third, I claim the perforated bar, T, in combination with the hand lever, N, and inclined "way," k, substantially in the manner and for the purpose set forth.

36,427.—John Shaefer, of Lancaster, Pa., for Improvement in Constructing and Attaching Iron Panels to Wooden Frames:

I claim the manner of making metallic panels with rods or lugs, a, attached, and inserting them into wooden stiles, drawn together and held in place by means of burs or screws, b, substantially as set forth for the purpose specified.

36,428.—J. H. Tanner, of Frauenfeld, Switzerland, for Machine for Folding and Stitching Paper:

I claim, first, The arrangement of the elastic bands, a2 e5, and clasps, e6, or their equivalents, in combination with the foldingblades as and for the purpose specified.

Second, The combination of a stitching device with the folding mechanism.

Third, The arrangement of the shears, k, and nippers, l, in combination with the stitching and folding mechanism, substantially as and for the purpose specified.

Fourth, The employment of the vibrating notched lever, k′, and curved slotted plate, k3, as described, for the purpose of operating the shears.

Fifth, The arrangement of the sliding clasp, l2, in combination with the spring jaws of the nippers, l, bracket, l′, and cross bar, l3, substantially as specified, for the purpose of opening and closing the nippers at the desired intervals.

36,429.—Hiram Tucker, of Newton, Mass., for Improved Bed Bottom:

I claim the undulating bed bottom constructed and operating substantially as described.

36,430.—William Van Anden, of Poughkeepsie, N. Y., for Improvement in Harvesters:

First, I claim making a section of the side rail of the frame next to the cutter and in front of the axle adjustable by connecting the same to the end of the stationary part of the rail by a center pin, so that when its lower end is disengaged from the end of the front rail of the frame, it may rotate on the center pin, substantially as hereinfore described and for the purposes set forth.

Second, I also claim the combination of the cutter bed (with the cutter bar working thereon), with the adjustable section of the side rail, substantially as hereinbefore described and for the purposes set forth.

Third, I also claim the combination of the propeller wheel on the side next to the cutter, of a two-wheel mowing machine, with a frame having an oscillating motion transversely of the path of the machine when the said wheel is arranged on the outside of the side rail of the oscillating frame, substantially as hereinbefore described.

Fourth, I also claim the use of the solid or fixed knife-edge bearing or shoulder formation on the propelling wheel axle, as a bearing on which to balance the frame of the machine and prevent it from slipping from side to side thereon, in combination with the said frame, and bearing, d2, of the main driving gear wheel, F, substantially as hereinbefore described and for the purposes set forth.

Fifth, I also claim the combination of the cutter bar elevator lever, with the back end of the flooring or table and frame of the machine, behind the axle of the propelling wheels, substantially as hereinbefore described and for the purposes set forth.

Sixth, I also claim the method of making an adjustable-spring driver's seat, in combination with the fixed or solid standard or spring stiffener projecting upward from the back edge of the table or flooring, substantially as hereinbefore described, and for the purposes set forth.

Seventh, I also claim the combination of the self-adjustable compensating pole with a frame having an oscillating motion transversely of the path of the machine and drag chain arranged and operating as hereinbefore described and for the purposes set forth.

Eighth, I also claim the use of the adjustable staple for locking the dragchain, in combination with a self-adjustable compensating pole, and drag chain attached to an oscillating mower frame, substantially as hereinbefore described and for the purposes set forth.

Ninth, I also claim the arrangement of the cutter bar of a mower frame having an oscillating motion transversely of the path of the machine and two propelling wheels, so as to operate forward of the axle of said propelling wheels, substantially as hereinfore set forth.

36,431.—John Vial, of Cleveland, Ohio, for Improved Pump for Low-Pressure Steam Engines:

I claim the cylinder, B, plunger, H, and piston head, F, in combination with the valves, D G M, and induction pipe, A, and exit pipe, L, these several parts being arranged and operating as and for the purpose specified.

36,432.—L. F. Whitney, of Charlestown, Mass., for Improvement in Rails for Street Railroads:

I claim the tread rib, f, in combination with the shoulder, b, and equidistant laterally-protruding knobs, substantially as shown and described.

36,433.—M. A. Winham, of North San Juan, Cal., for Improvement in Hose Couplings:

I claim the employment, for the purpose of fastening hose couplings, of two or more hinged stirrups, B, in combination with the wedge-shaped noses, b, constructed and operating substantially in the manner herein set forth.

36,434.—J. W. Woolsey, of Niles, Mich., for Improvement in Potato Diggers:

I claim the standard, C, shanks or wings, E E, and bar, F, in connection with the slats, G, of flat, oval or any approximate form attached edgewise to the standard, C, and bar, F, to operate as and for the purpose herein set forth.

I further claim separately the flat, oval-shaped slats, G, when attached edgewise to the parts which support them, to operate as and for the purpose specified.

[This invention consists in the employment of a double mold board formed of slats and provided with a front piece or coulter, with shanks or wings attached, the slats being constructed and arranged in such a manner as to greatly facilitate the passage of the earth between them and at the same time throw the potatoes out of the hills and to either side of them, as the implement is drawn along.]

36,435.—Benjamin Zurn, of New York City, for Improved Sawing Machine Adapted for the Use of the Auger and Chisel:

I claim the adjustable or sliding head, C, in combination with the bar, D, and the spring, L, connected to the saw slides, P Q, the saw being driven from the shaft, T, substantially as described, and all arranged to operate as and for the purpose set forth.

[The object of this invention is to combine a sawing machine, which will be capable of slitting work or resawing, and sawing scroll work, with a mortising machine and a boring device; the invention is so arranged that it may be used in any of the capacities above stated with a very slight adjustment of parts and perform its work in a perfect manner.]

36,436.—Elijah Barton (assignor to A. B. White and J. W. Barton), of East Hampton, Conn., for Improved Alarm Bell for Doors:

I claim an alarm door bell composed of a bell, A, having a spring, D, with a hammer, E, attached, secured to its arm or support, B, substantially as shown and described.

[This invention relates to a new and useful improvement in alarm bells for doors; it consists in a novel way of arranging the hammer and applying the same to the bell whereby the cost in the manufacture of this class of bells is materially reduced and a much simpler device obtained than that previously constructed, one less liable to get out of repair and easily put in working order if slightly deranged by use.]

36,437.—Bethuel Keith, Adolph Behr and N. S. Keith, of New York City, for Improved Process of Calcining Ores and Minerals:

I claim a mode or process of oxydizing (or roasting or calcining), all oxydizable substances, such as metals, minerals, sulphurets, bisulphurets and ores, and at the same time and operation reducing to a metallic state such unoxydizable metals as may be present therein, by the use of the apparatus and in the manner herein described, or any other apparatus or manner substantially the same, and which will produce the intended results.

36,438.—B. F. Lee, of New York City, and H. A. Alden, of Fishkill, N. Y., assignors, to the New York Rubber Company, for Improvement in Hose Reels:

We claim a hose reel embracing the combination with a frame of conical, cylindrical or other convenient form capable of revolution on a vertical spindle, of supporting hooks or brackets arranged spirally substantially as herein shown and described.

36,439.—G. M. Mowbray, of Titusville, Pa., assignor to himself and Bradhurst Schieffelin, of New York City, for Improved Naval Defensive Armor:

I claim, first, So constructing the framing of the vessel with timbers, C C, or their equivalents, projecting outward beyond the ribs, A A, and so applying the armor plates in combination with such timbers or equivalents that the weight of the armor is supported to such extent as may be desirable by the said timbers, or equivalents, and by them transmitted to the keelson of the vessel, substantially as herein specified.

Second, The combination of the plates, D D and a a, the blocks, c c and d d, the angle pieces, e e, or their equivalents and the lining, f, the whole constructed and applied in combination with the ribs, A A, substantially as herein specified.

36,440.—H. M. Paine, of Worcester, Mass., assignor to E. M. Archibald, of New York City, for Improvement in Steam Generators:

I claim the process of generating and superheating steam by injecting water in a comminuted state into superheated steam, by contact with which its particles are converted into steam, and afterwards permitting the circulation of the steam so obtained through a heated chamber to be superheated, substantially as herein specified.

36,441.—S. A. Skinner, M. D., of Bristol, Vt., assignor to himself and Silas Ruggles, of Fitchburg, Mass., for Improved Bedstead, Lounge and Chair:

I claim the frame, A, provided with the folding legs, B, in combination with the sliding back, F, connected to the frame, A, through the medium of the slides, E, fitted in the longitudinal groove, e, in the outer sides of the side pieces, a a, of the frame, A, and the pivoted racks, j, all arranged as and for the purpose herein set forth.

[This invention relates to a new and improved folding bedstead, lounge and chair, constructed in such a manner that it may, by a very simple manipulation, be conveniently converted into any one of the devices above specified, and when not required to be used in any way be capable of being folded compactly, so that it may be stowed away in a small space, and also very readily packed in quantities for transportation.]

36,442.—John Sutton (assignor to himself and James Gregory), of New York City, for Improved Combination of Sofa and Vessel Berth:

I claim, first, The combination with the fixed frame, A, of the seat and berth frame, E, and seat, substantially as and for the purpose set forth.

Second, The combination with the sofa box, C, constructed as described, of the seat-elevating doors or stops, d d′, substantially as and for the purpose set forth.

Third, The arrangement at the back of the seat and in the manner described, of the hoisting gear, for the purpose set forth.

36,443.—Isaac Cummings (assignor to himself and Eugene J. Post), of Vienna, N. J., for Improved Method of Operating Shakers of Thrashing Machines:

I claim operating the shaker by a direct connection with the main shaft of the motive power, independent of the thrashing cylinder belt, and detaching the shaker from all working connection with the thrashing cylinder frame.

RE-ISSUES.

1,340.—S. R. Andres, of Troy, N. Y., for Improvement in Articles of Food made from Beans, Peas, &c. Patented July 23, 1861:

I claim the manufacture of flour, meal, grits, or grains, from beans, peas or corn, substantially as and for the purposes described.

1,341.—F. F. Fowler, of Crane Township, Ohio, for Improvement in Hay Elevators. Patented April 17, 1860:

I claim, first, In the construction of elevators for hay, the combination of the permanent pyramidal supporting frame and the revolving crossbar and its braces, with a central supporting piece, for allowing the crossbar and its braces to turn upon the supporting frame, substantially in the manner and for the purpose described.

I also claim in the construction of elevators for hay, in combination with the crossbar, revolving upon an under supporting frame, the so arranging of the sheaves and hoisting tackle, as that the weight to be raised shall be upon one end of the crossbar, whilst the power to raise that weight is applied to the opposite end of the crossbar, for the purpose of enabling me to use a small and compact structure, that may be easily transported or moved, occupying but little space, and sufficiently rigid within itself, without the use of additional guys, braces or other fastenings, as herein described and represented.

I also claim in the construction of elevators for hay two pyramidal frames, one placed upon the other, the under frame being upright and the upper one inverted, and the head blocks or speces of both so united as that the upper frame may freely turn upon, whilst it is supported by, the lower frame, substantially in the manner described.

1,342.—Wm. H. Horstmann, of Brooklyn, N. Y., for Improvement in Submarine Cables for Telegraphs. Patented Sept. 13, 1859:

I claim, first, The combination of a conductor insulated and then covered with a fibrous coating material to form an elastic bed for the outer wires, substantially as herein described, combined with exterior wire or wires laid parallel with the conductor as and for the purposes set forth.

I also claim the link for splicing the length of the conductor as above specified.

1,343.—W. H. Horstmann, of Brooklyn, N. Y., for Improvement in Submarine Cables for Telegraphs. Patented Sept. 13, 1859:

I claim forming the cable herein described, by the apparatus substantially as herein set forth, consisting of coating reservoirs and wrapping apparatus, &c., or their equivaleuts.

I also claim the final reservoir, m, for coating a telegraph cable just before it enters the water or ground, substantially as and for the purposes described.

I also claim manufacturing the cable at the time it is laid, when found advantageous so to do, as above specified.

DESIGN.

1,655.—S. H. Ransom, of Albany, N. Y., for Design for a Cook Stove.

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PATENTS FOR SEVENTEEN YEARS.

The new Patent Laws enacted by Congress on the 2d of March, 1861, are now in full force, and prove to be of great benefit to all parties who are concerned in new inventions.

The duration of patents granted under the new act is prolonged to SEVENTEEN years, and the government fee required on filing an application for a patent is reduced from $30 down to $15. Other changes the fees are also made as follows :—

On filing each Caveat	$10
On filing each application for a Patent, except for a design	$15
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On appeal to Commissioner of Patents	$20
On application for Re-issue	$30
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On filing application for Design, seven years	$15
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The law abolishes discrimination in fees required of foreigners, excepting reference to such countries as discriminate against citizens of the United States—thus allowing Austrian French, Belgian, English, Russian, Spanish, and all other foreigners except the Canadians, to enjoy all the privileges of our patent system (exceptin cases of designs) on the above terms.

During the last sixteen years, the business of procuring Patents for new inventions in the United States and all foreign countries has been conducted by Messrs. MUNN & CO., in connection with the publication of the SCIENTIFIC AMERICAN ; and as an evidence of the confidence reposed in our Agency by the Inventors throughout the country, we would state that we have acted as agents for more than FIFTEEN THOUSAND Inventors! In fact, the publishers of this paper have become identified with the whole brotherhood of Inventors and Patentees at home and abroad. Thousands of Inventors for whom we have taken out Patents have addressed to us most flattering testimonials for the services we have rendered them, and the wealth which has inured to the Inventors whose Patents were secured through this Office, and afterward illustrated in the SCIENTIFIC AMERICAN, would amount to many millions of dollars! We would state that we never had a more efficient corps of Draughtsmen and Specification Writers than are employed at present in our extensive Offices, and we are prepared to attend to Patent business of all kinds in the quickest time and on the most liberal terms.

The Examination of Inventions.

Persons having conceived an idea which they think may be patentable, are advised to make a sketch or model of their invention, and submit it to us, with a full description, for advice. The points of novelty are carefully examined, and a reply written corresponding with the facts, free of charge. Address MUNN & CO., No. 37 Park-row, New York.

Preliminary Examinations at the Patent Office.

The advice we render gratuitously upon examining an invention does not extend to a search at the Patent Office, to see if a like invention has been presented there, but is an opinion based upon what knowledge we may acquire of a similar invention from the records in our Home Office. But for a fee of $5, accompanied with a model or drawing and description, we have a special search made at the United States Patent Office, and a report setting forth the prospects of obtaining a Patent &c., made up and mailed to the Inventor, with a pamphlet, giving instructions for further proceedings. These preliminary examinations are made through our Branch Office, corner of F and Seventh-streets, Washington, by experienced and competent persons. More than 5,000 such examinations have been made through this office during the past three years. Address MUNN & CO., No. 37 Park-row, N. Y.

How to Make an Application for a Patent.

Every applicant for a Patent must furnish a model of his invention if susceptible of one; or if the invention is a chemical production, he must furnish samples of the ingredients of which his composition consists, for the Patent Office. These should be securely packed, the inventor's name marked on them, and sent, with the government fees by express. The express charge should be prepaid. Small models from a distance can often be sent cheaper by mail. The safest way to remit money is by draft on New York, payable to the order of Munn & Co. Persons who live in remote parts of the country can usually purchase drafts from their merchants on their New York correspondents; but, if not convenient to do so, there is but little risk in sending bank bills by mail, having the letter registered by the postmaster. Address MUNN & Co., No. 37 Park-row, New York.

Caveats.

Persons desiring to file a Caveat can have the papers prepared in the shortest time by sending a sketch and description of the invention The government fee for a Caveat, under the new law, is $10. A pamphlet of advice regarding applications for Patents and Caveats, in English and German, furnished gratis on application by mail. Address MUNN & CO., No. 37 Park-row, New York.

Foreign Patents.

We are very extensively engaged in the preparation and securing of Patents in the various European countries. For the transaction of this business, we have offices at Nos. 66 Chancery-lane, London; 29 Boulevard St. Martin, Paris; and 26 Rue des Eperonniers, Brussels. We think we can safely say that THREE-FOURTHS of all the European Patents secured to American citizens are procured through our Agency.

Inventors will do well to bear in mind that the English law does not limit the issue of Patents to Inventors. Any one can take out a Patent there.

Circulars of information concerning the proper course to be pursued in obtaining Patents in foreign countries through our Agency, the requirements of different Patent Offices, &c., may be had gratis upon application at our principal office No. 37 Park-row, New York or either of our Branch Offices.

Rejected Applications.

We are prepared to undertake the investigation and prosecution of rejected cases, on reasonable terms. The close proximity of our Washington Agency to the Patent Office affords us rare opportunities for the examination and comparison of references, models, drawings, documents, &c. Our success in the prosecution of rejected cases has been very great. The principal portion of our charge is generally left dependent upon the final result.

All persons having rejected cases which they desire to have prosecuted are invited to correspond with us on the subject, giving a brief story of the case, inclosing the official letters, &c.

Assignments of Patents.

The assignment of Patents, and agreements between Patentees and manufacturers, carefully prepared and placed upon the records at the Patent Office. Address MUNN & CO., at the Scientific American Patent Agency, No. 37 Park-row, New York.

It would require many columns to detail all the ways in which the Inventor or Patentee may be served at our offices. We cordially invite all who have anything to do with Patent property or inventions to call at our extensive offices, No. 37 Park-row, New York, where any questions regarding the rights of Patentees, will be cheerfully answered.

Communications and remittances by mail, and models by express (prepaid), should be addressed to MUNN & CO., No. 37 Park-row, New York.

Notes and Queries

R. W., of N. Y.—Percussion in mechanics means the striking of one body against another, or the shock arising from the collision of two bodies. The theory of percussion with respect to the comparison of pressure and percussion has engaged much discussion among philosophers.

J. T., of Mass.—Water is very slightly compressible, but for all common purposes it is considered incompressible. It is this quality which renders it so useful for being employed in Bramah pressers and hydraulic jacks, by which thousands of pounds pressure to the square inch may be transmitted in a rising column for elevating great weights. The tubes of the Victoria tubular bridge, each weighing 1,200 tuns, were raised 100 feet by water pressure through hydraulic presses.

S. T., of Conn.—Gas made from resin has about double the illuminating power per cubic foot of gas made from coal. The gas which is made from cannel coal is also much richer in olifient gas (which is the principal agent of illumination) than the gas obtained from ordinary bituminous coal, like that at Pittsburgh, Pa. It is not the quantity of gas, therefore, which determines its value, but its illuminating power.

J. S. H., of Pa.—It is true, as you state, that the elementary gases of steam are hydrogen and oxygen, which produce an explosion when ignited ; but steam is never decomposed in a boiler by red hot iron plates except by absorbing the oxygen and setting the hydrogen only (which is not explosive), free. An explosion in a steam boiler, therefore, cannot be accounted for by the chemical theory but by overpressure of the steam, as a low pressure easily tears asunder weakened, overheated plates.

C. C., of Mass.—The manufacture of paper was introduced into England in 1588. We do not know precisely when its manufacture began in this country, but it is said that the first mill was erected in Delaware in 1714. The term Fourdrinier, as applied to paper making machine, originated from a wealthy firm of stationers in London who made valuable improvements in paper machinery. Like many other inventors they failed to realize that reward for the ingenuity which they deserved.

P. G. E., of Pa.—Martin's boiler differs from the common tubular marine boiler in having water in the tubes instead of using the tubes for flues. It is described in "Engineering Precedents" by Mr. Isherwood, Engineer-in-Chief, U. S. N.

D. & H., of Ohio.—The invention which you describe for making steel is the same as that patented by Josiah M. Heath, of England in 1839. You have evidently not made the history of this subject a study or you would not have wasted your time in reinventing a process so well known to the trade.

J. S., of N. J.—Before the introduction of machinery for the purpose, lint was made on a large scale by hand. In this process the linen rag or cloth was stretched on a small table and a sharp knife suspended above it, with the edge parallel with one series of the threads, the filling, for instance, was brought down upon the cloth with a force so exactly adjusted that it cut part way through those threads which were at right angles with the edge of the blade. The knife then received a slight motion lengthwise, turning up the severed fibers in a very light, loose, soft, feathery nap ; and the sheet of lint was still left with considerable strength in the direction of the threads which lay parallel with the knife, and which were consequently not cut.

A. C. I., of O.—A is right. After the pressure in the generator has risen above 10 pounds and thus become sufficient to open the check valve the pressure in the receiver will always be 10 pounds less than that in the generator, for the effect operating to close the valve is equal to the pressure in the receiver plus the weight on the valve, while the effect operating to open the valve is equal to the pressure in the generator.

C. G. C., of Mich.—Machines have been invented for loading a wagon with hay as the wagon is drawn along ; but it is quite possible that you may have a novel and patentable arrangement of parts to effect the desired object. You had better send us a sketch or model of the device, as we could then give you an opinion respecting its patentability.

L. E., of Conn.—The fact that the heads as well as the tails of comets are a vapory mass is proved by stars being visible through them. There is generally a small nucleus which may be opaque.

A. T., of Vt.—Prof. Charles A. Seely, 241 Canal street, New York, will make a reliable analysis of your ores.

M. B. G., of N. Y.—The army with which Xerxes invaded Greece was measured by building a square inclosure and filling it with soldiers standing as close as they could to each other, counting them, and then filling the inclosure in succession with all the troops. After making allowances for probable exaggeration, the most intelligent historians estimate the numbers of this army at 1,700,000 fighting men. The largest number ever killed on one side in any battle was probably 80,000, the number of Romans who fell at the battle of Cannae.

M. S. T., of Ill.—Polishing wheels made of gum shell-lac and emery are in constant use, and have been for several years. They give good satisfaction.

S. M. C., of N. Y.—In spite of the authority of any number of the daily papers you may be sure the phrase "The ship was laying at the wharf," is not grammatical. To lay is a transitive verb, and unless a ship has the power of laying eggs or laying something else, this verb cannot be used in connection with her. It should certainly be "The ship was lying at the wharf."

N. R. G., of Ohio.—The usual charge of powder for breaching masonry is ⅓ the weight of the solid shot. Benton says that this is the greatest that can be fired without overstraining the gun and its carriage ; and, besides, as the resistance of the air increases nearly with the square of the velocity, very little additional useful effect would be produced by a greater charge. The mean weight of siege guns is about 260 times the weight of the shot.

C. S. D., of N. Y.—It has been stated in the papers that the French Government has paid Prof. Doremus over $50,000 for the right to use his cartridge.

A. B. W., of Mich.—Any importer of books will get you Lt. Harris's rules for rifle shooting. Morgan James, of Utica, will make you a good telescopic rifle. Maynard's breech-loading rifle is held to be good for hunting purposes. The cost for a telescopic rifle will be about $70, we believe.

E. F. J., of R. I.—You have judged correctly of our silence respecting the "great motor" to which you refer. The utility of any invention can only be determined by a practical test.

A. M. A., of Mo.—The propulsion of steamers by a column of water ejected through a bent tube at each side of the vessel was undoubtedly the invention of your father—Alex. Anderson of Philadelphia—in 1812, and it has been revived several times since. About six years ago a steamer so propelled was built at Leith in Scotland, and was used for fishing, but we never heard whether it was successful or not. In all likelihood, the one lately tried on the river Scheldt in Belgium, to which you refer, has been copied from the one that was built at Leith.

J. H., of N. J.—Under the circumstances you speak of the the first experimenter has no claim whatever to the invention because he abandoned his experiments. The patent of the second experimenter is valid, whether he knew of the abandoned experiments or not, and he has all the rights of any patentee, as well against the first experimenter as others. "Legal priority" attaches to him who is both the first and original inventor—who only is entitled to a patent in any case. An experimenter would not be regarded as an inventer if he failed to complete the invention.

R. S. M., of Mass.—Electro-plating without a battery is conducted as a regular business at least at one place in the country. L. L. Smith, at College Point, Long Island, uses for all his extensive operations Beesely's magneto-electric machine, driven by a steam engine.

Money Received

At the Scientific American Office on account of Patent Office business, from Wednesday, Sept. 10, to Wednesday, Sept. 17

Persons having remitted money to this office will please to examine this list to see that their initials appear in it, and if they have not received an acknowledgment by mail, and their initials are not to be found in this list, they will please notify us immediately, and inform us the amount, and how it was sent, whether by mail or express.

C. I. Van O., of N. Y., $15; O. S. G., of N. Y., $15; H. M., of Mass., $15; S. N. L., of Mass., $43; J. C. B., of Wis., $25; L. K., of Mass., $25; C. A. R., of N. Y., $30; J. K., of N. J., $22; E. D., of Mass., $15; H. G., of Pa., $15; J. W. F., of Pa., $15; H. C. A., of Ill., $40; F. & K., of Cal., $25; J. J., of Mass., $15; E. T. S., of N. Y., $250; J. J. E., of N. Y., $250; W. & F., of N. Y., $200; F. N., of Conn., $10; J. McN., of Pa., $25; H. H. S., of N. Y., $25; L. F. H., of N. Y., $25; P. McG., of Iowa, $15; A. B. S., of Pa., $50; H. & K., of N. Y., $25; J. L. B., of R. I., $25; T. S., of Ky., $25; G. C. G., of Ill., $15; C. E. S., of Wis., $20; C. C., of Mass., $15; J. M. M., of N. Y., $10; R. F. C., of N. Y., $15; A. Y. McD., of Iowa, $25; G. M. C., of Me., $25; T. & P., of Conn., $15; J. B., of N. Y., $12; J. K., of N. J., $37; E. F. & J. H., of N. Y., $10; C. & M., of N. Y., $25; R. P. G., of Wis., $20; A. B., of N. J., $20; C. H. & G. W. D., of Pa., $20; W. D. A., of N. Y., $80; P. & G., of N. Y., $20; I. H., of Wis., $20.

Specifications and drawings and models belonging to parties with the following initials have been forwarded to the Patent Office from September 10 to Wednesday, September 17, 1862 :—

J. K., of N. J. (2 cases); G. C., of Mich.; J. C. B., of Wis.; L. K., of Mass.; A. J. B., of Iowa; J. McN., of Pa.; L. F. H., of N. Y.; C. A. R., of N. Y.; J. B., of N. Y.; E. F. & I. H., of N. Y.; W. H. F., of Mass.; G. M. C., of Me.; A. Y. McD., of Iowa; T. S., of Ky.; T. W. W., of Mich.; J. L. B., of R. I.; S. N. L., of Mass.; H. H. S., of N. Y.; H. U., of N. Y.; A. T. F., of N. Y.; H. & K., of N. Y.; W. L. L., of Mass.; A. McG., of Iowa; W. D. A., of N. Y. (2 cases).

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TO OUR READERS.

RECEIPTS.—When money is paid at the office for subscriptions, a receipt for it will always be given ; but when subscribers remit their money by mail, they may consider the arrival of the first paper a *bona fide* acknowledgment of our reception of their funds.

INVARIABLE RULE.—It is an established rule of this office to stop sending the paper when the time for which it was pre-paid has expired.

Models are required to accompany applications for Patents under the new law, the same as formerly, except on design patents when two good drawings are all that is required to accompany the petition, specification and oath, except the government fee.

PATENT CLAIMS.—Persons desiring the claim of any invention which has been patented within thirty years, can obtain a copy by addressing a note to this office, stating the name of the patentee and date of patent, when known, and inclosing $1 as fee for copying. We can also furnish a sketch of any patented machine issue since 1853, to accompany the claim, on receipt of $2. Address MUNN & CO., Patent Solicitors, No. 37 Park Row, New York.

NEW PAMPHLETS IN GERMAN.—We have just issued a revised edition of our pamphlet of *Instructions to Inventors*, containing a digest of the fees required under the new Patent Law, &c., printed in the German language, which persons can have gratis upon application at this office. Address MUNN & CO.,
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Twenty-five Cents per line for each and every insertion, payable in advance. To enable all to understand how to compute the amount they must send in when they wish advertisements inserted, we will explain that ten words average one line. Engravings will not be admitted into our advertising columns ; and, as heretofore, the publishers reserve to themselves the right to reject any advertisement they may deem objectionable.

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INVENTORS AND CONSTRUCTORS OF NEW AND useful Contrivances or Machines, of whatever kind, can have their Inventions illustrated and described in the columns of the SCIENTIFIC AMERICAN on payment of a reasonable charge for the engraving.

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For further particulars, address—

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THE "ENGINEERS' SCIENTIFIC SOCIETY OF THE City of New York," was organized on Tuesday evening, September 2, 1862. John L. Rockwell, President; David Paterson, Vice President; John W. Harnett, Recording Secretary; John H. Fisher, Financial Secretary; George M. Gibbens, Treasurer. 1*

FURNITURE WHOLESALE AND RETAIL.—DEGRAAF and Taylor still continue the Wholesale and Retail Furniture and Bedding business at No. 87 Bowery, New York, and have now on hand the largest surplus stock ever before offered in this city, which they are determined to close out at very low prices; also Carll's Patent Towel Stand and Clothes Dryer, the most convenient article in use. All work guaranteed as represented. DEGRAAF & TAYLOR, No. 87 Bowery, New York. 12 22*

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UNIVERSAL CLOTHES WRINGER.—AGENTS AND Canvassers wanted for this best of all Wringers. Rubber Clothing Company, 37 Milk street, Boston. R. O. BROWNING, Agent, 345 Broadway, New York city. 11tf

POLYTECHNIC COLLEGE OF THE STATE OF PENNsylvania, West Penn Square, Philadelphia. The Scientific School begins Monday September 8th. The Technical Schools for the professional education of Civil, Mining and Mechanical Engineers, Architects and practical Chemists will open on Tuesday September 16. The course on Military Engineering, including Siege Operations, Field Fortifications, Strategy, Tactics and Drill will be enlarged and continued On the return of the President, now visiting the Military and Industrial Institutions of Europe, the Faculty, by availing itself of the knowledge and means of instruction there obtained, will keep the college fully up to the European standard. For tenth annual announcement, address ALFRED L. KENNEDY, M. D., President of Faculty. 11 3

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TO PHOTOGRAPHERS.—IMPROVED PHOTOGRAHIC Camera, Patented March 25, 1862, by A. B. WILSON (Patentee of the Wheeler and Wilson Sewing Machine), adapted to all photographic work; such as Landscapes, Stereoscopic Views, Carte Visites, Ambrotypes, &c. Can be used by amateurs and others from printed directions. Send for a circular. Address A. B. WILSON, Waterbury, Conn. 1tf

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FULTON'S COMPOUND, FOR CLEANSING STEAM boilers of scale.—This article is powerful to remove scale, and will not injure the boiler. Western agents, WALWORTH, HUBBARD & CO., Chicago, Ill. Sole proprietor, E. H. ASHCROFT, No. 82 Sudbury street, Boston, Mass. 9 tf

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Different Glazes used for Cooking Utensils.

The *Journal d'Anvers* has the following by M. Depaire :—

The wrought and cast iron vessels which are to be placed on the fire are often covered with enamel, which protects the liquid from metallic contact with the sides.

Two compositions are generally employed for this purpose, one having for base silicate of lead, and the other boro-silicate of soda. These enamels are applied to the scoured surface of the metal in the form of a powder, which is fixed by heating it to a sufficiently high temperature to fuse it; it then spreads over and covers the metal with a vitreous varnish.

The boro-silicate of soda enamel possesses great superiority over that of silicate of lead, for it is unattacked by vinegar, marine salt, the greater number of acid or saline solutions, even when concentrated, and resists the action of the agents employed in cooking or chemical operations.

The silicate of lead enamel is whiter and more homogeneous, which explains the preference given to it by the public; but it gives up oxide of lead to vinegar or to common salt; it acts upon a great number of coloring matters, and it is attacked by nitric acid, which immediately communicates a dull appearance to it. On evaporation the liquid leaves a white crystalline residue of nitrate of lead. This enamel is instantly darkened by dissolved sulphides, and also by cooking food containing sulphur, such as cabbage, fish and stale eggs.

It is very easy to distinguish these two enamels by means of a solution of sulphide of potassium, sodium, or ammonium. On allowing a drop of one of these re-agents to fall on the vessel to be tested, the lead enamel darkens in a few moments, whilst the boro-silicate of soda enamel retains its white color.

A Novel System of Tug Boat Traction.

In the *Annual Retrospect of Engineering and Architecture*, recently published in England, is the following :—

Perhaps the most striking application of steam power to water transport is the one lately made upon the Seine, in both its upper and lower reaches, and now in course of application to some of the artificial lines of water communication of France. In this case the first step was to establish between Paris and Rouen, following all the windings and locks of the Seine, a strong chain cable lying loose upon the axis of the navigable channel. Steam tug boats are provided, carrying engines of 150 or 200-horse power, working at high pressure upon the same principle as the locomotive engine. The boats bear fore and aft guide pulleys, susceptible of being moved by the same machinery as the rudder, which take up the slack of the cable and lead it to a drum wheel, round which it passes a sufficient number of times to produce an efficient resistance to the action of the engine, and thus to propel the boat without either wheels or screw working on the water. The barges to be towed follow at a small distance behind, or they are occasionally lashed to the sides of the steam tugs and in this manner trains of 6, 8 or 10 barges, of 240 tuns each, descend the Seine at the rate of 6 miles per hour, or remount it at the rate of four miles an hour, at prices per haulage considerably lower than those formerly paid for horse traction. It is something of this description which is required for our artificial canals, modified, no doubt, for the passage of small tunnels, unfit to receive engines blowing off large volumes of steam and smoke, and for the canals having soft muddy bottoms; but as the cost of establishing such a system must be considerably less in England than in France, it would be very desirable to attempt its application here.

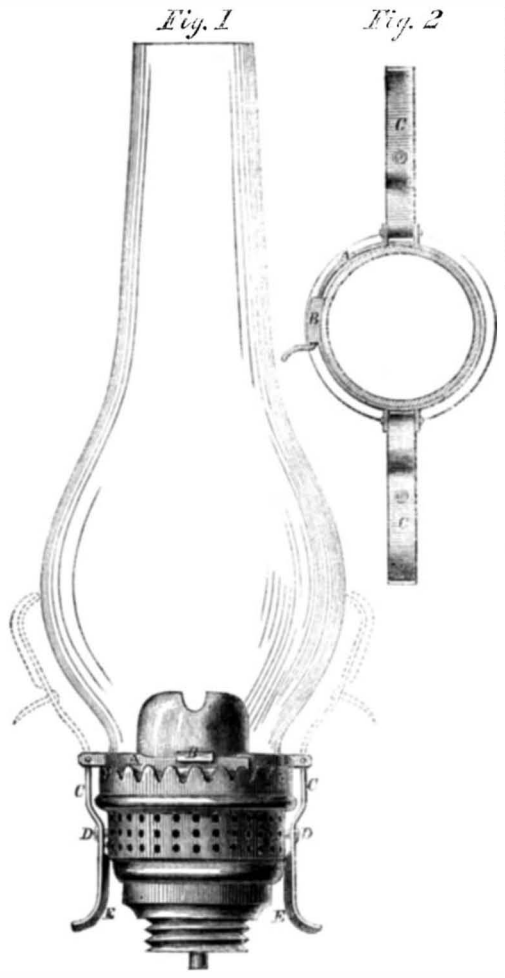
The Woven Wind.

One of the most characteristic manufactures of India is the fine Dacca muslin or "woven wind," as it has been called. So fine is this material that when laid upon the grass to bleach the dew makes it disappear. This used to be spun by native females who had been trained to it from their infancy. So nice was the sense of touch required for the spinning of this yarn, that they were constantly waited upon by a retinue of servants whose duty it was to relieve them of all menial offices which might endanger the fine tactual faculty which long practice and seclusion had bestowed on their delicate finger tips. Singularly enough, although the steam engine and spinning machine can produce far finer yarn than any that the fingers of Hindoo maiden ever spun, the English looms, in other respects so perfect, cannot weave the Daccan muslin. The fine yarns require to be taken back to India to be woven by hand into the flimsiest of tissues by the rudest and most primitive of all looms.

HODGSON'S CHIMNEY FASTENER AND HOLDER.

The removal of a chimney from a lamp while the lamp is burning, is an exceedingly annoying and difficult operation, and many chimneys are broken while being thus removed. The annexed engraving represents a simple and cheap attachment which may be applied to any lamp, and by means of which a heated chimney may be handled with perfect ease and safety.

Fig. 1 is an elevation of a lamp with the attachment applied, and Fig. 2 is a horizontal section of the attachment.



The device consists of a light ring, A, surrounding the chimney just above the flange. One end of this ring is furnished with a clasp, B, into which the other end enters so that the ring will easily adjust itself to the chimney when expanded by heat. Two arms or clamps, C C, are hinged to the ring and furnished with pins, D, which easily enter the perforations in the side of the burner. When it is desired to remove the chimney the arms can be turned up against the heated glass, as shown by the dotted lines in Fig. 1, and the chimney removed. These arms are provided with cloth or other non-conducting material, as seen at E, to prevent the fingers from coming in contact with the heated metal. When the arms are down they serve to ornament the lamp and hold the chimney firmly in position without obstructing the light.

While this attachment forms one of the best chimney fasteners known, it serves the additional purpose of furnishing a holder or handle for removing the chimney. As it is attached to the chimney it can be sold with that and used on any lamp, new or old, without any change in the construction of the lamp.

The patent for this invention was granted August 7, 1862, and further information in relation to it may be obtained by addressing the inventor, Isaac Hodgson, Indianapolis, Ind.

The pores are the orifices of minute convoluted tubes which lie beneath the human skin, and when straightened measure each about the fourth of an inch. According to Erasmus Wilson, the number of these tubes which open into every square inch of the surface of the body is 2,800. The total number of square inches on the surface of an average-sized man is 2,500, consequently the surface of his body is drained by not less than twenty-eight miles of tubing, furnished with 7,000,000 openings.

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FROM THE STEAM PRESS OF JOHN A GRAY

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